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ABSTRACT

This manual presents the very basics of monitoring, evaluation, and evaluative research as applied to population education. It is designed for beginners and is useful to project staff charged with the responsibility of monitoring, evaluation, and research. Chapter 1 discusses monitoring and evaluation. Chapter 2 examines evaluative research designs and chapter 3 presents examples of evaluative research designs for both formal and non-formal population education, including experimental and quasi-experimental designs. Chapter 4 discusses data analysis techniques including measures of central tendency, variation, relationship, comparison of two groups, comparing related or matched samples, the sign test, t-test for matched samples, t-test for independent groups, Spearman's rank correlation, Pearson's correlation coefficient, and the chi square test. Chapter 5 reviews guidelines for writing an evaluative research report. Chapter 6 examines cost-effectiveness of population education activities. (RSL)

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# PREFACE

This Manual is the output of a Regional Training Workshop on Evaluative Research in Population Education which was organized by the Unesco Regional Office for Education in Asia and the Pacific in Manila from 20 to 31 May 1985.

The Manual is a simplistic presentation of the very basics of monitoring, evaluation and evaluative research as applied to population education. It is a Manual for beginners, which the participants in the Regional Training Workshop feel would be immediately useful to project staff charged with the responsibility of monitoring, evaluation and research.

The evaluative research designs cum instruments (i.e. questionnaires, interview schedules and tests), and data analysis techniques were developed in about ten days. Besides, by and large, the participants were amateurs in evaluative research. Hence, the evaluative research designs developed are far from sophisticated. However, these are the kind of evaluative researches which the participants feel are urgently and immediately needed, and those which most of them could easily cope with.

The Manual represents an initial step towards attempts to assess not only the *outputs* of population education programmes, but also *effects* and *impact*.

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## Chapter One

# MONITORING AND EVALUATION[*]

**Introduction.** There is an advantage in discussing monitoring, evaluation and evaluative research separately, as they have somewhat distinctive emphases, although they also share certain common features. All these call for the collection of information to make decisions about programmes. In the case of monitoring, the emphasis is mostly on the mechanics of programme implementation as explained more fully in the next two paragraphs. In evaluation, as the word itself implies, there has to be a judgement of worth. Such judgement could either be intuitive and subjective or objective and based on hard data derived from carefully planned research studies. In the latter case, the activity is described as evaluative research.

It is to be noted that the definition of monitoring and evaluation in this report may be rather limited, and this is mainly because of the desire of the participants to conceptualize monitoring and evaluation in the context of population education programmes.

**Monitoring.** To monitor a programme is to collect information and make decisions chiefly in relation to the quantitative aspects of programme implementation, including logistics. A programme plan is pre-requisite for monitoring, since it is the implementation of the plan that is monitored. Monitoring begins with the commencement of plan implementation and continues throughout the duration of the implementation. Evaluation and evaluative research on the other hand could begin before a programme plan is drawn up, so that the insights derived from them are inputs into the planning process. Moreover, both can continue after the implementation has been completed.

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[*] Based on the lecture presentation of Prof. J.E. Jayasuriya, Resource Person of the Regional Training Workshop on Evaluative Research in Population Education, in Manila from 20 to 31 May 1985.

Two functions of monitoring are (i) the ascertainment of information as to whether implementation is going on as planned; and (ii) decision making. These decisions will relate, *inter alia,* to the exploration of ways and means of overcoming any problems that arise in implementation, changes or adjustments (e.g. in cost estimates, time schedules), or even to the introduction of new inputs that are needed. A programme plan is by no means a Procrustean bed. Programme plans should be regarded as being modifiable, when there are sound and weighty reasons for doing so. Two uses of monitoring are implicit in what has already been stated here. Certain other uses may, however, be mentioned. Many education programmes are of a pilot nature, and if wider diffusion is envisaged, valuable insights may be gained from the monitoring of the pilot programme, and these would be very suggestive in planning the diffusion. Often, a programme cycle has to be followed by one or more programme cycles, and in this case the monitoring of the first programme would give useful insights for planning the subsequent programme cycles. Finally and quite importantly, monitoring is essential for discharging the function of accountability, whether it be to internal authorities or to external authorities.

Most programme plans have the following items:

1. The problem(s) for the solution of which the programme is being undertaken.
2. The objectives of the programme.
3. Programme coverage.
4. Programme strategies.
5. Administrative and supervisory structure of the educational system insofar as it has a bearing on the programme.

6. Programme inputs:
    - a) financial;
    - b) personnel;
    - c) equipment;
    - d) materials.
7. Programme processes:
    - a) research studies;
    - b) preparation of instructional/training materials for:
        - i) trainers;
        - ii) teachers;
        - iii) learners.
    - c) delivery of programmes to:
        - i) trainers;
        - ii) teachers;
        - iii) learners.
8. Monitoring and evaluation.

Not all of the above come within the scope of monitoring and only those which lend themselves to monitoring will be discussed here. From the standpoint of monitoring, programme coverage provides a good item with which to start. By programme coverge in this context is meant the target population to which the programme is to be offered. In general, the target population will consist of trainers of teachers, teachers and learners. The last named are the ultimate recipients, while the other two categories are intermediaries. Depending on the locations, numbers educational levels and other particulars regarding the learners to be reached (the plan will specify them), the locations, numbers and categories of the teachers to be reached will be specified in the plan, and depending on these in turn there will be an identification of the trainers of the teachers. While trainers, teachers and learners are the actual programme targets, programme plans recognize the need to provide some orientation to politicians, media personnel, educational administrators and personnel higher than or equal in level to the trainers in order to sensitize them to the importance of the programme and get their support for implementing it. Thus, the target population may be described in terms of those who need orientation, and those who need training/instruction. Programme coverage has to be monitored so that shortfalls in locations, numbers, categories and time schedules are noted, and remedial action promptly taken. It is specially important to identify whether any segments or individuals of the intended population have not been reached, and how this could be set right.

It is of value to monitor programme strategies to ensure that they are workable. For example, a strategy to reach school-children may be through the incorporation of population content in certain subjects which they study in school. Monitoring will show whether this strategy is feasible, and if it is not feasible an alternative strategy has to be used. To give an example from the non-formal sector, the strategy in the plan may be the use of a literacy programme to convey population content, but if it is found that the literacy programme does not attract a sufficient number of learners, the use of another strategy will have to be considered.

Any new educational programme has to be implemented within the administrative and supervisory structure in operation in the educational system of the country concerned. This structure could be supportive, indifferent, or inimical either in its totality or in certain identifiable aspects or among certain persons. It is an important function of monitoring to ascertain the reactions of administrators and supervisors to the programme. If all or any of them are indifferent or inimical, ways and means of making them supportive have to be considered. If many are already supportive, perhaps the support could be even more enhanced. Another item to be monitored is the presence or absence of linkages, as the presence of certain essential linkages could strengthen the implementation of the programme. For example, if one unit of the Ministry of Education is preparing a curriculum for the new programme, and there is another unit undertaking the revision of textbooks, the implementation of the new programme will be facilitated or hindered according to the presence or the absence of mutually supportive linkages.

The monitoring of financial inputs can show whether the funding envisaged in the plan is forthcoming, whether the amounts earmarked for various items of expenditure are released without any reductions and at the times specified in the plan. The project management staff for their part should spend the money according to the plan and should not divert it, wholly or partly, for other purposes. Monitoring should ensure that these conditions are observed, and take note of any departures from them, and of the reasons for such departures. Where the reasons are not sufficiently convincing, any similar deviation in the future from the plan should be discouraged. Monitoring will also take note of any bottlenecks in the financial processes and recommend remedial action. It is also one of the uses of monitoring to examine the case for an increase/decrease in the total allocation, or the allocation for a particular component, and the need, should it arise, for transfer of funds from one item to another.

The programme plan will specify the inputs of personnel envisaged as being needed to implement the programme, at what points of time and for how long they should be in position. Any departures from the plan should be identified through monitoring and the reasons for them gone into. If such departures are beneficial, the original plan may be changed to accommodate them, but if they are not beneficial insistence on following the plan without deviation from it would be necessary. Plans usually envisage that when a position is filled for a certain period, one and the same person will hold the post unless otherwise provided in the plan. One task of monitoring is to ensure that there is no turnover of programme personnel, or that it is reduced to a minimum, as such turnover could be an impediment to effective implementation. It is necessary to make reference here also to the fact that if the programme plan envisages that certain full time staff would be in position, this requirement should be strictly complied with. A programme can scarcely progress as planned, if programme personnel who are expected to devote their full time to it do not comply with this requirement. It sometimes happens that certain personnel needs are overlooked in the plan. For example, the need for a financial assistant to receive and disburse money may not have been envisaged at the programme planning stage because the volume of work involved in the management of funds was underestimated. Or, the need for a technician to operate equipment and keep it in good condition may not have been envisaged. Another fact to be taken note of is the occurrence of bottlenecks resulting from an insufficiency of certain categories of personnel. For example, the number of typists may not be sufficient to cope with the outputs of the professional staff. These and a variety of other problems may come to the surface during the process of monitoring, and if this happens immediate action can follow to set them right.

The equipment and materials needed for programme implementation will be stated in the plan. They should be supplied strictly according to the specifications (e.g. make and model numbers of a copying machine or a typewriter) and the time schedule mentioned in the plan, which means that the orders will have to be placed sufficiently ahead. Monitoring should show the extent to which these requirements are taken into account. It is presumed that in making specifications at the planning stage, care was taken to ensure that repair facilities and spare parts for equipment are readily available. If monitoring shows that this is not the case, serious consideration should be paid to the action that might be taken to meet this problem. Furthermore, the purchase of equipment during the remaining period of the programme should be reviewed with due regard to the need to ensure that repair facilities and spare parts are available. It should also be one of the responsibilities of the exercise of monitoring to ensure that equipment purchased for the programme is not diverted to other programmes.

The programme plan will provide for certain research studies to be carried out partly to support curriculum and instructional materials development, and partly to support the delivery of programmes to trainers of teachers, teachers and learners. There will also be a time schedule for the research studies. The research studies should be carried out as planned both in regard to their scope and to their timing. If the studies are more limited in scope than at first planned, the data from them will be less than comprehensive; and if they are carried out much later than the time for which they were planned, the data may come too late to be used for the intended purposes. Monitoring should take care of these dangers, and also ensure that usable research findings are in fact utilized for programme development.

The programme plan will provide for the preparation of instructional and training materials for trainers of teachers and teachers and instructional materials for learners. Materials should be prepared, reviewed, field-tested, revised and made available to the intended users in time. By programme delivery to trainers of teachers is meant the training of trainers of teachers. Such training may include periods of training/internship programmes/observation abroad, and certain training activities carried out within the country itself. Trainers have, in turn, to provide training to teachers through the use of face-to-face methods or self-instructional methods, so that the teachers, in turn, may provide instruction to learners, be they in the formal system or out-of-school. The progress of these activities, all of which are interconnected, needs careful monitoring to identify avoidable and unjustifiable departures from what was planned both in regard to modalities and timing. Corrective action that may become necessary should be decided upon and undertaken as expeditiously as possible.

From the foregoing account, it should be clear that the need for monitoring, based on a comprehensive information system, cannot be over-emphasized. Some of the data needed for monitoring can be collected as a matter of routine by the requirement that certain information should be regularly provided by the various units and individuals engaged in programme implementation. Certain kinds of data may be collected on a small scale by interviews, questionnaires or site visits.

While there is unanimity on the value of monitoring programme implementation, a difference of opinion exists as to whether monitoring should be an entirely internal affair undertaken exclusively by the programme staff, or whether there should be a certain amount of monitoring by one or more persons not belonging to the programme staff and selected from within or outside the country. The balance of opinion seems to be that while the day-to-day monitoring should be carried out by the programme staff and those specially engaged to oversee the programme, a view of the programme from outside at least once in two or three years would be of considerable value.

Evaluation. Evaluation is the process of making judgements of worth and decisions on the basis of information collected for these purposes. Among several models of evaluation suggested in the literature on evaluation, the ensuing discussion takes as its framework a model that distinguishes four categories, namely: context evaluation, input evaluation, process evaluation and product evaluation spelling out for each category its objectives, methods, and relationship to decision-making in the various phases of programme planning and implementation.* Within that framework, however, the presentation made below is eclectic in the sense that on certain matters of detail there are departures from the analysis envisaged in the model.

It is useful at the very outset to draw a distinction between formative and summative evaluation. Formative evaluation focuses on the design and operational components of a programme, gathering data and making judgements of worth about them with a view to arriving at decisions for effecting improvements as the programme moves along. Thus, the thrust of formative evaluation is to identify strengths and weaknesses, and arrive at decisions regarding the use of appropriate alternatives for improving the programme by maximizing the strengths and reducing the weaknesses. Summative evaluation focuses on outcomes or impact *per se*, assessing these as high or low with a view to making decisions as to whether the programme is useful or not, and whether the programme should be continued or not. The results of certain assessments could be used either formatively or summatively. An assessment such as the marks obtained on an achievement test is used formatively when the analysis of the data and a review of antecedent processes (e.g. the teaching) lead to decisions regarding the changes to be made in programme processes to improve achievement; the assessment is used summatively when no such analysis or review is undertaken and the judgement made is whether performance is good or bad, leading to a decision as to whether the programme is useful or not. Basically, the distinction lies in the uses to which the judgements of worth based on the assembled data are put. Certain kinds of data are useful for both formative evaluation and summative evaluation, while certain others may be more useful for one or the other. It follows that depending on the purpose of the evaluation - summative or formative - one can decide on the kinds of data to be collected.

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*This model is referred to as the CIPP model.

Context evaluation. The starting point for context evaluation is a situational analysis in which the need is identified for an observed condition that prevails at present to be transformed into a more desirable condition in the future. For example, the quality of life of the mass of people in the countries of the Third World is far from satisfactory, and there is an urgent need to improve it. The first is the present condition and the second signifies the desired condition for the future. Many governments, recognizing that rapid population growth stands in the way of attaining a high quality of life have, *inter alia,* put their faith in population education as an educational intervention that might, in the course of time, lead to responsible parenthood and modest reproductive behaviouir, resulting in an improvement in the quality of life. The problem, the need, and the nature of the intervention having been thus identified, context evaluation will assess the acceptability of such an educational programme to the community, and the feasibility of its introduction into the school system and non-formal education. Assuming that acceptability and feasibility have a high probability of being assured, steps are taken to make preliminary assessments of the objectives, strategies, administrative structure, inputs and processes necessary for a population education programme; to weigh alternatives in these respects, and incorporate the decisions taken in a programme plan with an appropriate time schedule. Context evaluation may therefore be regarded as pre-planning evaluation culminating in the preparation of a programme plan.

Input evaluation. Input evaluation concerns itself with the evaluation of programme inputs. In general, they are the administrative structure within which the programme is implemented and such inputs as finance, personnel, equipment and materials. While monitoring will identify departures from the programme plan, it is the task of evaluation to make qualitative assessments. Personnel, equipment, and materials lend themselves to such assessments. The questions to be asked are, for example, whether the personnel are qualified and competent, and whether the equipment and materials are the most appropriate for carrying out programme activities. Relevant data about them have to be collected and judgements of worth brought to bear upon the data. Decisions, if any, for change in the interests of more effective programme implementation will come partly from monitoring, partly from evaluation and partly from both.

Process evaluation. Process evaluation has an extensive coverage, necessitating the making of judgements of worth about curriculum materials, training activities, teaching-learning processes, and decision making following upon these judgements.

Curriculum materials may be evaluated in regard to such aspects as (i) their relevance to the needs of learners; (ii) their suitability for the age, ability, and experience of learners; (iii) their coverage of population related topics; (iv) their coverage of the cognitive, affective and skills domains; (v) their relevance and likely contribution to the achievement of programme objectives; (vi) their sequencing and how they fit into the rest of the curriculum; (vii) the extent and nature of learner participation they envisage; and (viii) the teaching methodologies to which they lend themselves. The evaluation of curriculum materials will be very largely formative.

The evaluation of training should be carried out *firstly*, to determine the extent to which the objectives set for the trainees (namely; acquisition of the knowledge base for teaching population content, acquisition of attitudes and values reflecting concern for quality of life and responsible parenthood, acquisition and practice of teaching skills emphasizing problem solving, inquiry processes, and value clarification, the acquisition of skills in monitoring and evaluation) have been achieved, *secondly*, to identify improvements that could be effected in the training itself, and *thirdly*, to test out the relative effectiveness of various modalities of teacher training.

Three stages may be identified in the evaluation of training. These are the following:

1. pre-training evaluation which includes (i) the collection of baseline data about the knowledge, attitudes, and skills of the trainees; and (ii) the analysis of their training needs and of the organizational requirements of the training;
2. in-training evaluation which includes the continuous assessment of the various training activities as they proceed in order to effect improvements in them for the more successful achievement by the trainees of the objectives set for them; and
3. post-training evaluation to determine the extent to which the objectives have been achieved, the relevant criteria being the changes which the trainees show in their knowledge and attitudes and the professional skills which they display in teaching learners.

It will be noted from the foregoing account, that the evaluation of training will have quite strong formative emphases as well as summative emphases.

In connection with the evaluation of teaching-learning processes, it is useful to note that in an educational setting learning takes place through interaction (i) between teachers and learners; (ii) between learners and instructional materials; and (iii) between learners. Teacher-learner interaction has to be evaluated regarding the extent to which it promotes knowledge and understanding, provides a setting for the development of responsible attitudes and values, and encourages the exercise of problem-solving skills, inquiry skills, values clarification to the evaluation of curriculum materials and further elaborations is not needed here. As far as learner-learner interaction is concerned, it is best exemplified in group work, a group being defined as consisting of two or more persons. Learner-learner interaction is important not so much for the transfer of knowledge, but attitudes and values which are often caught from peers rather than taught by teachers, and also for the practice of problem-solving, inquiry and values clarification skills through gorup activities. All these lend themselves to both formative and summative evaluation.

**Product evaluation**. Product evaluatioin is by and large concerned with the evaluation of learning outcomes. The nature and objectives of a programme of population education are such that Benjamin Bloom's classification into the cognitive, affective and psychomotor domains needs suplementation by the recognition of a skills domain to incorporate problem-solving skills, inquiry skills and values clarification skills, which need to be developed in both teachers and learners. The evaluation of learning outcomes throws light on the learners, the teaching-learning processes, and even the objectives of the programme, and the findings may be used for formative or summative purposes.

**Programme effects and impact**. In the 1980's there has been increasing concern on the *effects* and *impact* of population education programme. However, there are conflicting views on the definition of programme effects and impact. An operational definition which emerged from actual problems in evaluating population education programmes in countries of the region is suggested in this manual.[1]

In Asia and the Pacific region, evaluation is built-in as one of the major activities of country projects in population education. However, the usual indicators of success are the project *outputs,* namely; (i) the variety and number of teacher's guides, supplementary readers, resource books, textbooks, field workers manuals, posters charts, slide and tape sets, etc. which are produced; and (ii) the number of educators provided orientation, teachers and field workers trained, and the students and out-of-school youth and adults taught population education. In the chart below, emphasis has been placed on citing achievements regarding items in columns 2 (process) and 3 (output). These are basically assessment of *efforts* and outputs *vis-a-vis* the evaluation of *effects* (column 4) and *impact* (column 5) of the programme. One scholar likens the evaluation of efforts to counting the number of times a bird flaps its wings, rather than measuring the distance covered.

Evaluation of effort and output, of course, needs to be done. These form parts of what has been referred to earlier as formative evaluation. In formative evaluation potential problem areas are identified and better programme implementation schemes are instituted to enhenace programme efficiency and effectiveness. But it is certainly not enough. To ascertain programme effects and impact systematic *evaluative research* need to be done. Evaluative research is dealt with in Chapter Two.

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[1] Based on Dr. Leonardo de la Cruz, *"Evaluative Research Design in Population Education"*. Reference paper presented in the Unesco Regional Training Workshop on Evaluative Research in Population Education, Manila, 20-31 May 1985.

## Chart 1. Evaluation of population education programmes: Systems approach

| Input (1) | Process (2) | Output (3) | Effect (4) | Impact (5) |
|---|---|---|---|---|
| - Professional Expertise of Staff | - Planning and Management | - National/Regional Plans/Projects | - Planning Management Competencies | - Fertility Behaviour |
| - Administrative Support Staff | - Curriculum and Materials Development | - Curricula Materials Developed | - Knoweldge and Attitude of Officials | - Economic Status |
| - Government Budget | - Training | - School Officials/Teachers/Other Personnel Trained | - Knowledge, Attitudes, Skills (Teaching/Learning) of Trainers and Teachers | - Other Changes in Quality of Life |
| - UNFPA Funding Support | - Research and Evaluation | - Completed Researches | - Knowledge, Attitude, Practice, Skills of Students and Field Workers | |
| - Other Funding | | | | |
| - Unesco's Technical Assistance | - Documentation | - Materials Collected, Analysed and Disseminated | - Knowledge, Attitude, Skills of Curriculum Writers | |

**Conclusion**. Monitoring, evaluation and evaluative research are essential elements in the planning and implementation of any programme to ensure that the programme is attaining its objectives as efficiently and as economically as possible without any undesirable side effects. This manual together with earlier publication *Manual on Evaluation in Population Education* (Bangkok, 1979) should provide an introductory knowledge base for undertaking these activities in the countries which have embarked on programmes of population education.

# Chapter Two

# EVALUATIVE RESEARCH DESIGNS: KNOWLEDGE BASE*

## Designs of Research

Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance.

An evaluative design spells out how an evaluation research will be done, i.e. what groups will be studied; when and how data will be collected, how these would be analyzed. The design tells the investigator, in effect, "Do this and this; don't do that or that; be careful with this; ignore this, and so on". It is the blueprint of the research architect and engineer.

Research design has two basic purposes, namely (i) to provide answers to research questions; and (ii) to control variance.

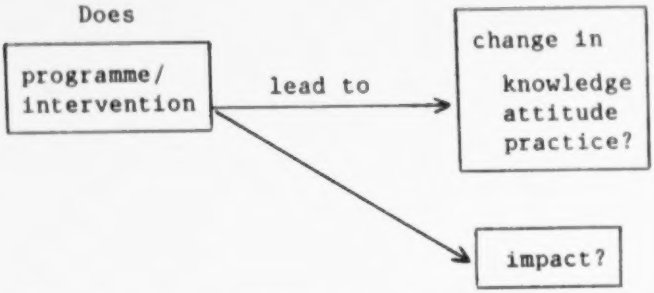
In experimental research, "control" of variance means: (i) controlling the variance of the extraneous or "unwanted" variables that may have an effect on the experimental outcomes; and (ii) minimizing the error or random variance, including errors of measurement.

The key questions, which evaluative research seeks to answer are: How effective is the treatment/intervention introduced? Does it produce a significant difference from what results without the treatment of intervention? Does it effect a significant gain in knowledge, a change in attitude or changes in behaviour? What is its overall impact?

---

*Based on the lecture presentation of Dr. Milagros D. Ibe, Professor, College of Education, University of the Philippines, consultant of the Regional Training Workshop on Evaluative Research in Population Education in Manila, from 20 to 31 May 1985.

Diagrammatically, this is illustrated in the following figure:



Experimental designs. Experimental research designs which may be used for evaluating the effects or impact of population education programmes can be categorized into three main groupings, namely (i) non-experimental; (ii) experimental; and (iii) quasi-experimental designs. Non-experimental designs are sometimes referred to as pre-experimental designs because they fail to meet the criteria of true experiments. Kerlinger (1976) refers to them as inadequate designs. At best, they give descriptive information about the programme since measured "effects" cannot be firmly attributed to the intervention or treatment.

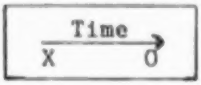
Quasi-experimental designs also fail to meet all the criteria for true experiments because they do not use randomization. However, they provide a close approximation to experimental designs and are definitely better than the non-experimental designs. Randomization is not always feasible; it is sometimes a costly and tedious process.

Pre-experimental designs. In the context of population education, these designs provide descriptive information about outcomes of the programme but do not enable the evaluator to firmly ascribe these to the programme.

1. *One group post-test design.* This is shown on the paradigm in Figure 1. The treatment, intervention or programme (represented by X) is given to a group. After a period of time,

say six months or a year, an observation (O) is made. The observation may be done through a knowledge test, an attitude inventory or a behaviour observation checklist to determine effects of the treatment (X) on the knowledge, attitude and behaviour respectively of the group.

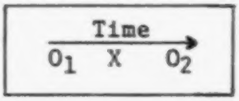
Figure 1



This design suffers from major weaknesses. Since there is no pretest (or initial measure), it is not possible to determine the extent of change effected by the treatment. Moreover, the design does not provide for a control group against which the post-test measure of the group studied can be compared.

2. *One group pretest-post-test design.* This design (Figure 2) is an improvement over the first design (Figure 1) in that there is a pretest or initial measure on which to base change or gain. However, since there is no control group for comparison purposes, the user of this design cannot firmly say that the gain or change observed from pretest to post-test is not due only to effects of history, maturation or testing.

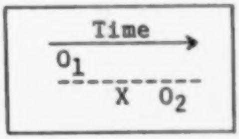
Figure 2



3. *Different pretest group.* This design provides for a pretest and a post-test, but these are administered to different groups. For example, the pretest is given to a group. Then the programme or intervention is given to another group. The latter group is administered a post-test, which is compared to the pretest

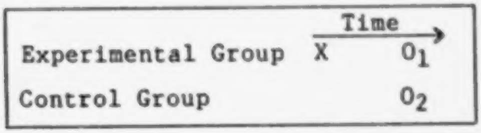
measure of the other group. This design, which is shown in Figure 3, attempts to compare the post-test measure with an initial measure from another group, the implicit assumption being that a similar pretest measure would have been obtained had the group given the treatment been given the pretest as well. However, since it is an altogether different group, the assumption may be untenable. Hence, even if $O_2$ is significantly higher than $O_1$, the difference may not be firmly attributable to the treatment X.

Figure 3



4. *Static group comparison.* In this design, a control or comparison group is introduced (Figure 4). Both groups are given a post-test although no treatment is given to the control group.

Figure 4



Since no pretest is made, the initial standing of the two groups is not known. No attempt is made to make them initially comparable or to match them. It is possible that differences noted between $O_1$ and $O_2$ are due to initial differences between the two groups. It is also possible that whatever edge the experimental group has over the control group is due mainly to the Hawthorne effect[1] and not really due to the treatment or intervention X.

---

[1] "Hawthorne effect" is the tendency of subjects to perform well because they know that they are being studied or observed.

Experimental designs. In the designs under this category, variances due to extraneous are controlled through random selection of subjects and random assignment of groups to treatments.

5. *Post-test control group design.* Two groups - a control and an experimental group - are randomly (R) constituted and assigned to the treatments (X and ~X) and given the same post-test after a time.

   It is assumed that the random selection of the subjects in each group has controlled all variables which might have an effect on the outcomes. If a pretest will tend to affect the post-test, this design is preferred over the next design. However, there is still the possibility that a significant difference between $O_1$ and $O_2$ is due mainly or in part to initial differences between the two groups.

   Figure 5

   | | Time → | |
   |---|---|---|
   | (R) Experimental Group | X | $O_1$ |
   | (R) Control Group | ~X | $O_2$ |

   It is to be noted that the control group need not be a case of absence of treatment. Treatment of another type (i.e. ~X) could be the control *vis a vis* a particular treatment (e.g. X); and the effects of the latter can be compared to the effects of no treatment (NX).

6. *Pretest-post-test control group design.* This design is the classical experimental design. It is ideal, though not always feasible. It avoids the weaknesses of the previous designs because it uses randomization, a comparison group, and a pretest (Figure 6). While there may be practice test effects on the post-test, these can be detected and statistically controlled.

Figure 6

| | Time → | | |
|---|---|---|---|
| (R) Experimental Group | $O_1$ | X | $O_2$ |
| (R) Control Group | $O_3$ | ~X | $O_4$ |

It is assumed that with randomization $O_1$ will not be significantly different from $O_3$. If that is so, then effects of the treatment can be inferred if $O_2 > O_4$ or $(O_2 - O_1) > (O_4 - O_3)$.

However, if $O_1$ and $O_3$ differ significantly, then the initial difference can be statistically controlled through analysis of covariance using the pretest score as a covariate.

7. *Multiple treatment, post-test only design.* In this design (Figure 7) more than one experimental treatment is compared with a control treatment. It is like repeating the design (Figure 5) several times over, but using the same control group each time. No pretest is used, on the assumption that the randomization controls all extraneous variables. This design is appropriate for studying, say, the relative effects of different methods of delivering population education.

Figure 7

| | Time → | |
|---|---|---|
| (R) | $X_1$ | $O_1$ |
| (R) | $X_2$ | $O_2$ |
| (R) | $X_3$ | $O_3$ |
| (R) | ~$X_4$ | $O_4$ |

8. *Multiple group, alternate pretest-post-test design.* This design combines those designs in Figures 5 and 6, and hence calls for four groups. It is sometimes called the Solomon Four-Group Design. With it, practice effects (if any) of testing can be observed. From

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   | (R) Experimental Group | X | $O_1$ |
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Figure 6

| | Time → | | |
|---|---|---|---|
| (R) Experimental Group | $O_1$ | X | $O_2$ |
| (R) Control Group | $O_3$ | $\sim X$ | $O_4$ |

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| | Time → | |
|---|---|---|
| (R) | $X_1$ | $O_1$ |
| (R) | $X_2$ | $O_2$ |
| (R) | $X_3$ | $O_3$ |
| (R) | $\sim X_4$ | $O_4$ |

8. *Multiple group, alternate pretest-post-test design.* This design combines those designs in Figures 5 and 6, and hence calls for four groups. It is sometimes called the Solomon Four-Group Design. With it, practice effects (if any) of testing can be observed. From

the four groups, effects of the treatment X can be firmly inferred.

Figure 8

|  | Time → |  |  |
|---|---|---|---|
| (R) | $O_1$ | X | $O_2$ |
| (R) | $O_3$ | ~X | $O_4$ |
| (R) |  | X | $O_5$ |
| (R) |  | ~X | $O_6$ |

Some of the relationships which may be expected are:

|  |  |
|---|---|
| $O_2 > O_1$ | effects of X |
| $O_4 > O_3$ | possible practice effects |
| $O_1 > O_3$ | initial comparability of the two groups |
| $O_2 > O_4$ | confirmation of effects of X |
| $O_5 > O_6$ | effects of X |
| $(O_2-O_1) > (O_4-O_3)$ | effects of X |
| $O_4 > O_6$ | practice effects |
| $O_2 > O_5$ | practice effects |

On the whole, however, our concern will be focused on the effects of the treatment X.

Quasi-experimental designs. Because randomization is not always feasible, researchers use alternative designs which do not demand randomization. Instead of randomized groups, matched groups are used; or a group is compared to itself. The designs used are quasi-experimental, and include the following:

9. *Time series design.* This is an improvement of Design No. 2 because instead of one observation before and one observation after the treatment X, several observations are made before and after X. This is shown in Figure 9 as on the following page.

Figure 9

| Time → | | | | | | |
|---|---|---|---|---|---|---|
| $O_1$ | $O_2$ | $O_3$ | X | $O_4$ | $O_5$ | $O_6$ |

The group is compared to itself. The use of the design in Figure 9 makes it possible to separate the reactive measurement effects from the effects of X.

10. *Non-equivalent group design.* This is an approximation of the true experimental design, but without randomization. An attempt is made to make the groups initially comparable.

Figure 10

| | Time → | | |
|---|---|---|---|
| Experimental Group | $O_1$ | X | $O_2$ |
| Control Group | $O_3$ | ~X | $O_4$ |

11. *Three-group design.* This design involves giving three groups a pretest at the same time. The groups are exposed to the treatment X at different times. A post-test is given at the end of the treatment. The post-test is also given to one of the two other groups to provide a comparison measure. Each of the two other groups takes two post-tests. (See Figure 11)

Figure 11

| | Time → | | | | | | |
|---|---|---|---|---|---|---|---|
| Group I | $O_1$ | X | $O_2$ | | | | |
| Group II | $O_3$ | | $O_4$ | X | $O_5$ | | |
| Group III | $O_6$ | | | | $O_7$ | X | $O_8$ |

12. *A variant of the four group design.* No randomization is required in this design. A delayed post-test is given to two of the groups, as shown in Figure 12 on the following page.

Figure 12

| | Time → | | | |
|---|---|---|---|---|
| Group I | $O_1$ | X | $O_2$ | |
| Group II | $O_3$ | ~X | $O_4$ | |
| Group III | | X | | $O_5$ |
| Group IV | | ~X | | $O_6$ |

## Internal and external validity

Earlier, it was said that the purpose of research design is to control variance to ascertain the internal validity of the research. Internal validity asks this question: "Did X, the experimental treatment, really make a significant difference?" Anything affecting the controls of a design becomes a problem of internal validity.

What are the criteria for a research design? The main criterion can be expressed in this question; "Does the design answer the research question?" or "Does the design adequately test the hypotheses?" The second criterion is control of independent and extraneous variables. To do this, it is best to randomize whenever possible, i.e. select subjects at random; assign subjects to groups at random; assign experimental treatments to groups at random. The third criterion is *generalizability*. It means, "Can we generalize the results of a study to other subjects, other groups and other conditions? How much can we generalize the results of the study? To whom or what can we generalize the results?" This third criterion is concerned with *external validity* or representativeness.

Campbell and Stanley[2] cite the following factors as threats to internal validity:

1. *History*, this refers to events which happen during an experiment or the implementation of a programme, which tend to influence its effects.

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[2] Donald T. Campbell and Julian L. Stanley's *Experimental and Quasi-Experimental Design and Quasi-Experimental Design for Research*. [Chicago, Rand McNally College and Publishing Co. 1979].

2. *Selection,* this refers to the bias introduced in the choice of subjects or the sample (e.g. taking subjects who volunteer or are pre-identified on the basis of a variable related to the dependent variable).

3. *Instrumentation,* this refers to the effect of research tools (as in the use of a different pretest and post-test instrument, or a questionnaire which has a reactive effect on the subjects).

4. *Testing,* this refers to the practice or reactive effect of a pretest on the post-test.

5. *Maturation,* this refers to change in the subjects over time, which is developmental change. For example, a pretest-post-test gain in weight may not be due to the diet introduced but to natural growth of the subjects.

6. *Mortality,* this refers to drop-out, loss or attrition of subjects during the study. For example, the low ability subjects may drop out from the experimental group, and as a consequence the post-test mean score is higher than what it would have been if the low ability members had stayed on.

7. *Measurement,* this refers to the influence of the assessment procedure. For example, the post-test results may be due mainly to increase sensitization due to the pretest and not to the experimental treatment. Controversial attitudes, for instance, seem to be especially susceptible to such sensitization.

8. *Regression,* this refers to a statistical phenomenon whereby scores on a pretest regress toward the mean, i.e. lower scores on the pretest tend to be higher, and higher scores lower on the post-test, when in fact no real change has taken place in the dependent variable.

**Control of extraneous variables**. Control of variance include minimizing, nullifying or isolating the influence of extraneous variables, i.e. independent variables which are not part of the study.

There are five ways to control an extraneous variable:

1. *Eliminate the variable.* To do this, the researcher can choose subjects so that they are as homogeneous as possible on that variable.
2. *Randomize.* Theoretically, randomization is the only method of controlling *all* possible extraneous variables.
3. *Build the variable into the design.* This means building it in as an attribute variable, thus achieving control and yielding additional research information about the effect of the variable on the dependent variable and about its possible interaction with other independent variables.
4. *Match subjects.* This is similar in principle to building the variable into the design. Matching has limitations however. The variable on which the subjects are matched must be substantially related to the dependent variable, or the matching is a waste of time. Matching on more than one variable leads to a loss of subjects. Matching of any kind is no substitute for randomization. If subjects are matched they should then be assigned to experimental groups at random.
5. *Use statistical control.* Analysis of covariance can be used to control an extraneous variable which influences the dependent variable. For example, if the pretest scores of two treatment groups differ significantly, then the initial difference can be controlled by using the pretest score as a covariate in the analysis of difference between the two groups' post-test scores.

## On Instrumentation for Evaluating Population Education Programme

Within the framework of the research design, there is a need to consider the instruments or data gathering devices for the research. For assessing knowledge or knowledge gain, the most common instruments are tests and other performance measures. Behaviour is measured through observation checklists or rating scales.

For measuring attitudes, there is a wide variety of instruments that one can use. Among them are the following:

1. Alternate response items.
2. Rating scales.
3. Likert scales.
4. Open-ended questions.
5. Sentence completion items.
6. Ranking items.
7. Observation checklists.
8. Situation tests.
9. Semantic differential.
10. Projective techniques.

Before going on to describe each of these different types of instruments, it is worthwhile reminding the researcher that instruments could have serious limitations. Some of the more important limitations are that instruments employed in educational measurement typically:

a) involve an inference rather than a direct observation of the attribute being measured;

b) employ arbitrary and unique scales of measurement;

c) consist of a sample of responses from a potentially unlimited set of such responses; and

d) reflect value judgements which are made during the construction of the instrument.

Generally, in attitude instruments there are no right or wrong answers. The intent is to get an indication of the respondent's attitude through his responses.

Alternative-response items. These are items which give the respondents only two options to choose from:

*Example:*

a) If you had the freedom to choose, where would you prefer to live?

_____ in the city
_____ in a rural area

b) Should population education be required in all schools? _____ Yes _____ No

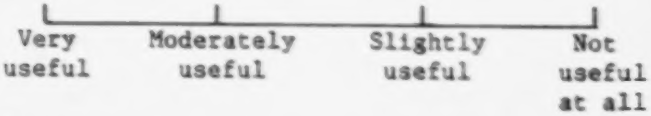
c) Should contraceptives be made available to all women between ages 20 to 45?
_____ Yes _____ No

Rating scales. These are structured items which provide answer options to the respondents. The options fall along a continuum. The scale could be descriptive, numerical, graphic or a combination of these types.

*Example:*

a) Based or your experience, how useful is a training course like this one?

*Graphic-descriptive:*



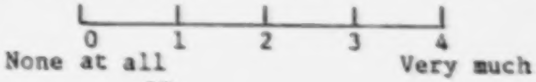
*Descriptive:*

_____ Very useful
_____ Moderately useful
_____ Slightly useful
_____ Not at all useful.

The above example is a 4-point rating scale. A 5-point scale can also be used.

*Example:*

b) How much new knowledge did you get from the training programme? (circle one number)



The descriptive scale options can be written as follows:

_____ Very much
_____ Much
_____ Moderately
_____ Little
_____ None at all

When several items using the same descriptive scale are put together, the scale points can be placed as column headings and the respondent simply checks (✓) the column corresponding to his answer to each item.

Likert Scale items. These are statements to which the respondent is asked to indicate agreement or disagreement, or if he is undecided/neutral. Five-point Likert Scales involve a range of responses ranging from "Strongly Disagree" to "Strongly Agree" with "undecided" as the middle point.

*Sample Likert Scale items.* Circle the letter which matches the extent of your agreement or disagreement with each of the following statements. The letters have these meanings:

SA - Strongly agree
A - Agree
U - Uncertain
D - Disagree
SD - Strongly disagree

*Begin here:*

1. A male first born child brings luck to the family.

   SA A U D SD

2. Families with more than four children are happier than families with only one or two children.

   SA A U D SD

3. If only one child is allowed, it is better to have a son than a daughter.

   SA A U D SD

4. If given the choice, I would prefer to live in the city.

SA A U D SD

Here are some pointers on how to write Likert Scale items:

1. Use short, simple and opinionated statements.
2. Be sure the statement conveys only one idea.
3. Avoid using factual statements.
4. Use statements on which opinions vary widely.
5. Avoid using double negatives.
6. Try to have as many negatively oriented statements as positively-oriented ones.
7. Have at least 10 statements in the set.

Open-ended questions. These are direct questions for which responses are constructed/written by the respondent. No answer options are provided.

This type of item is used when qualitative information is called for. In the analysis, the responses can be grouped by categories, and frequences of mention can be reported.

*Example:*

What are peoples' reasons for preferring large families?

What would be the consequences if population growth is allowed to continue unabated?

**Sentence completion items**. These are unfinished statements which the respondent is asked to complete. The beginning phrase or clause should stimulate the respondent to think.

*Examples:*

Complete the unfinished statement by writing the first thought that comes to your mind:

1. Our ancestors had large families because
______________________________
______________________________

2. Having few children is advisable because
______________________________
______________________________

3. When I see families with many children I feel
______________________________
______________________________

4. If people are not given population education, they would ____________________
______________________________

5. The best time to introduce population education in schools is ____________________
______________________________

**Ranking items**. These consist of a set of homogeneous items (concepts, methods, topics) which the respondent is asked to rank according to a specified criterion (for example, according to frequency of use, importance, effectiveness) as he perceives them.

*Example:*

Rank these training methods according to how effective you consider them for teaching population education. Write "1" for the most effective, "2" for the next most effective, "3" for the next, and so on:

_____ Lecture
_____ Discussion
_____ Film showing
_____ Role playing
_____ Demonstration

_____ Problem solving
_____ Field trips
_____ Observation of classes
_____ Workshops
_____ Other (specify ________
______________________________

Observation checklists. These are lists of expected behaviours which are expected to be manifested. The observer is asked to indicate whether or not he observed each of the behaviours.

Here is a sample observation checklist for a lesson in population education.

| | Yes | No |
|---|---|---|
| 1. Does the teacher: | | |
| a) state the lesson objectives? | _____ | _____ |
| b) cite realistic examples? | _____ | _____ |
| c) use appropriate visual aids? | _____ | _____ |
| d) elicit student views? | _____ | _____ |
| e) make use of students' ideas? | _____ | _____ |
| 2. Are the examples cited: | | |
| a) relevant to the age group? | _____ | _____ |
| b) linked to everyday problems? | _____ | _____ |
| c) linked to other subjects? | _____ | _____ |

Semantic differential. This is a special type of rating scale. Bi-polar descriptors are used for 5- or 7-point scales. On each descriptive scale, the rater indicates with "X" the point which matches his rating of the concept being rated.

The respondent is asked to answer the items fast, instead of thinking too deeply on each concept. What is important is that he register his perception of the concept.

*Example:*

The materials used in this training programme are:

Easy ___ ___ ___ ___ ___ ___ ___ Difficult

Interesting ___ ___ ___ ___ ___ ___ ___ Boring

Irrelevant ___ ___ ___ ___ ___ ___ ___ Relevant

Well-written ___ ___ ___ ___ ___ ___ ___ Badly written

Illegible ___ ___ ___ ___ ___ ___ ___ Legible

Unimportant ___ ___ ___ ___ ___ ___ ___ Important

Situation tests. In this type of item, the stimulus is a situation which poses a problem. The respondent is asked how he will act or behave under the given circumstances. Sometimes the item includes structured options. Other times, the item is unstructured that is, open-ended.

*Example:*

You had been living in the city for ten years. On your return to your home province you could not help noticing the many children in your relatives' homes. Most of the children were not adequately clothed and some looked malnourished.

What would you most likely do under the circumstances?

____ 1. Talk to my relatives and suggest they consider limiting their families.

____ 2. Make a joke about how fast my relatives have increased in number.

____ 3. Keep quiet but silently resolve that I would not let myself have a big family like them.

____ 4. Ignore what I observed. The number and condition of their children are not my concern.

____ 5. Other (specify) ______________________________
______________________________

Projective techniques. In sentence completion and situation test items, the respondent projects himself and unknowingly reveals his beliefs, values and attitudes. Projective-techniques have this purpose: to get the respondent to unknowingly reveal thoughts, biases, attitudes (likes and dislikes) as he responds to seemingly unrelated stimulus situations.

Examples of projective test items are the following:

1. Draw a picture of a happy family; of an unhappy family.
2. Given this picture (show a picture), what do you think the man/woman in the picture is thinking of?
3. Write a paragraph/story telling what you think happened immediately before this situation (as shown in a picture) took place.

## Chapter Three

# EVALUATIVE RESEARCH DESIGNS: SOME SAMPLES

Introduction. One of the main objectives of the Regional Training Workshop on Evaluative Research on Population Education, which was organized by the Unesco Regional Office for Education in Asia and the Pacific in Manila from 20 to 31 May 1985 was "to co-operatively develop various evaluative research designs with accompanying data gathering instruments/tools and data analysis techniques on different problem areas of population education.

In view of the fact that many of the participants are beginners in evaluative research, and that the regional workshop was only for two weeks, the evaluative research designs and instruments developed are quite simple. The designs do not involve complicated data analysis techniques. By and large, the evaluative research designs developed in the Workshop are those which most of the participants feel they ought to do and could do upon their return.

The participants of the Regional Training Workshop worked as two groups. The Formal Population Education Group (Group I, Annex A) developed three evaluative research designs, namely (i) a pre-experimental design entitled, "Determinants of Population Knowledge and Attitudes of Secondary School Teachers of Population Education"; (ii) an experimental design entitled, "The Relative Effectiveness of Two Techniques of Teaching Population Education to Secondary School Students"; and (iii) a quasi-experimental design entitled, "An Evaluation of an Innovative Approach to In-Service Training of Middle School Teachers of Population Education". The evaluative research designs together with the research instruments are presented on the following pages.

## A Pre-experimental Design: Ex-post Facto Design

*Title:* Determinants of Population Knowledge and Attitudes of Secondary School Teachers of Population Education

**Rationale**. Some of the countries of the region have had population education at the secondary school level for more than a decade. In this context, the classroom teachers have been exposed to pre-service and in-service training programmes, as well as to curriculum guides and resource materials in population education. The purpose of this study is to compare the teachers' knowledge with the knowledge expected of them as population education teachers. It also intends to find out what their attitudes are with regard to population issues. Since the programmes have more or less completed the first cycles, an *ex-post facto* design is used for the study. The study intends to determine which of the variables about the teachers (their characteristics, training and context variables) are related to and/or influencing their knowledge and attitudes towards population education.

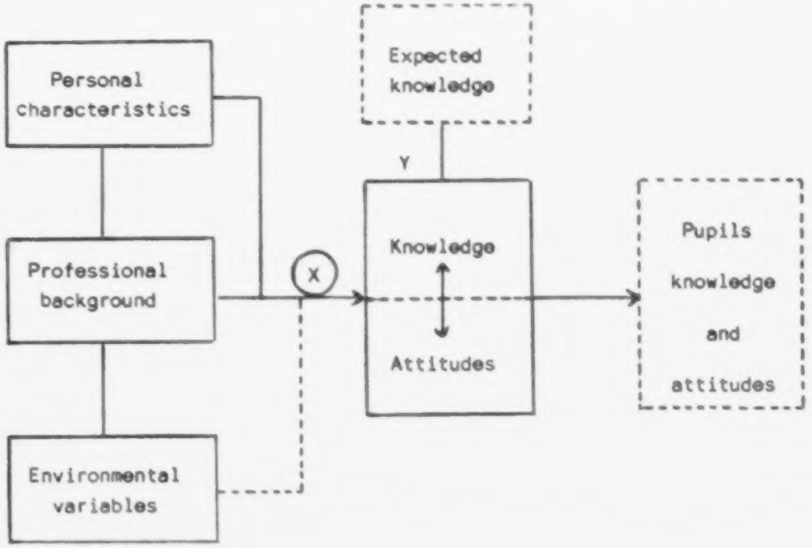
**Goal and objectives**. The goal of this study is to assess the effects of the population education programme on the level of knowledge and attitudinal characteristics of the secondary school teachers teaching population education. The specific objectives are to: (i) study the profile of teachers of population education; (ii) determine the level of knowledge in population education of secondary school teachers; (iii) determine their attitudes towards population education and population issues; (iv) compare the level of expected knowledge with the manifested knowledge of the teachers; (v) identify variables which correlate with the teachers' knowledge and attitudes; and (vi) determine which combination of variables can be used to predict the teachers' knowledge and attitude scores.

**Conceptual framework**. The population education contents which should be taught are prescribed in the syllabuses prepared for teaching population at the secondary school level. Thus the expected learning is very well defined.

However, the expected learning has to be obtained by teachers who vary in many attributes, among which are: (i) personal characteristics (sex, age, religion, marital status); (ii) educational attainment; (iii) professional attainment; (iv) teaching experience; (v) experience in teaching population education; (vi) exposure to training programme in population education; (vii) exposure to resource materials; (viii) support given by the school administration; and (ix) supportiveness of the community.

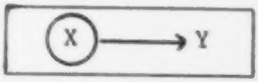
This study assumes that a teacher's ability to teach population education is dependent on his/her knowledge of population concepts and his/her attitudes toward population education. There are, of course, other determinants of the teachers' knowledge and attitudes. The study will test the hypothesis that some or all of the teacher variables listed above are determinants of teachers' knowledge of population concepts and attitudes toward population issues.

The conceptual framework is diagramatically shown below:


Personal characteristics
Expected knowledge
Y
Professional background
X
Knowledge
Attitudes
Pupils knowledge and attitudes
Environmental variables

**Hypotheses**. Since this is an *ex-post facto* study on the effects of the programme, the teachers' attributes are considered independent variables. The hypotheses are that: (i) the manifest knowledge scores will be different from the expected knowledge scores; (ii) teachers' knowledge and attitudes are correlated with their personal characteristics, professional training and environmental variables; and (iii) there is a combination of variables which can be used to predict the teachers' knowledge and attitude scores.

**Methodology**. The design of the study is as follows:



where X is the Population Education Programme which has already been implemented. It is not manipulated in this study.

Y = manifested knowledge and attitude.

*Sampling*. A purposive selection will be made of some education districts or regions which are representative of the country, taking into account the population distribution. For the purpose of the study only public schools which are involved in the population education programme will be chosen. The number of regions/districts will be such as to ensure that the 5 per cent sample is not more than 200. The actual selection will be done on a stratified random basis.

*Research instruments*. The instruments of the study will be (i) a background data collection questionnaire; (ii) a knowledge test of the multiple-choice type; and (iii) an attitude test of the Likert Scale type.

*Data collection and analysis*. To compare scores of two groups on the tests of knowledge and attitude, the t-test will be used. The Pearson correlation technique and chi-square analysis will be used to determine relationships between variables. Multiple regression analysis will be used to identify significant determinants of knowledge and attitude scores. The .05 level of significance will be specified for all statistical tests.

Expected outcomes. The study hopes to identify some antecedent attributes of teachers which determine their performance in the knowledge and attitude tests. (The assumption is that the teachers' performance positively correlates with the performance of their pupils.)

The attributes which are part of the programme, and which have been identified as predictors of performance may be considered for further development. Furthermore, the results of this study could be utilized as base-line data in the planning, implementation and evaluation of future programmes in population education.

Instrumentation. In preparing the research instruments a table of specifications was used (Table 1). Likewise, after the experimental trial use of the research instruments, an item analysis table was prepared (Table 2). The research instruments were revised accordingly, on the basis of the findings of the item analysis. The revised research instruments are on pages 41 to 49.

## Table 1. Specifications for knowledge questions

| Question No. | Population concept | Type of Question | | | | |
|---|---|---|---|---|---|---|
| | | Recall | Definition | Application | Calculation | Matching |
| 1. | Population of country | ✓ | | | | |
| 2. | Doubling rate | | | | ✓ | |
| 3. | Population of some country | ✓ | | | | ✓ |
| 4. | Population projection | ✓ | ✓ | | | |
| 5. | Population pyramid | | | ✓ | | |
| 6. | National income | ✓ | ✓ | | | |
| 7. | Rate of growth | ✓ | ✓ | | | |
| 8. | Population dynamics | | | | | ✓ |
| 9. | Consequences of RPG* | | | ✓ | | ✓ |
| 10. | Carrying capacity | | ✓ | ✓ | | |
| 11. | Aims of population education | ✓ | | | | |
| 12. | Family planning | ✓ | ✓ | | | |
| 13. | Quality of Life | | | ✓ | | |
| 14. | Consequences of RPG* | | | | | |
| 15. | Fertility | ✓ | ✓ | | | |
| 16. | Population Growth economy | | | ✓ | | |
| 17. | Population and food | ✓ | | | | |

*RPG means Rapid Population Growth.

## Table 2. Item analysis

| Items | Response option (f) | | | | NR | Difficulty levels (%) | High | | Low | | Discrimi-nation Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | | | R | W | R | W | |
| 1. | 2 | 11 | ④ | 0 | 2 | 21 | 3 | 5 | 1 | 7 | .25 |
| 2. | 6 | ⑤ | 6 | 0 | 2 | 27 | 1 | 5 | 3 | 6 | .25 |
| 3. | 8 | ③ | 2 | ⑤ | 1 | 27 | 3 | 5 | 1 | 7 | .25 |
| 4. | 8 | ③ | 5 | 3 | 0 | 16 | 1 | 7 | 2 | 6 | .13 |
| 5. | 9 | 5 | 2 | ② | 1 | 11 | 1 | 7 | 0 | 8 | .13 |
| 6. | 1 | 11 | ③ | 1 | 3 | 16 | 2 | 0 | 1 | 7 | .13 |
| 7. | 8 | 0 | ⑧ | 2 | 1 | 42 | 5 | 3 | 1 | 7 | .50 |
| 8. | 1 | 9 | 4 | ④ | 1 | 21 | 4 | 4 | 0 | 8 | .50 |
| 9. | ④ | 2 | 7 | 4 | 2 | 21 | 2 | 6 | 1 | 7 | .13 |
| 10. | 1 | ⑩ | 4 | 3 | 1 | 53 | 5 | 3 | 3 | 5 | .25 |
| 11. | 1 | ⑪ | 5 | 1 | 1 | 57 | 7 | 0 | 2 | 7 | .25 |
| 12. | 7 | 1 | 4 | ⑥ | 1 | 32 | 4 | 4 | 0 | 8 | .30 |
| 13. | 2 | 7 | ⑩ | 0 | 0 | 53 | 8 | 0 | 1 | 7 | .81 |
| 14. | 1 | 7 | ⑨ | 2 | 0 | 48 | 4 | 4 | 3 | 5 | .13 |
| 15. | 7 | 5 | 0 | ⑦ | 0 | 27 | 1 | 7 | 3 | 5 | .25 |
| 16. | 2 | 0 | 4 | ⑫ | 1 | 64 | 7 | 1 | 3 | 5 | .50 |
| 17. | 0 | 5 | 1 | ⑫ | 1 | 64 | 6 | 2 | 4 | 4 | .25 |
| 18. | 1 | 13 | 4 | 0 | 1 | 69 | 6 | 2 | 5 | 3 | .13 |
| 19. | 2 | 2 | 6 | ⑧ | 1 | 32 | 5 | 3 | 1 | 7 | .50 |

The formula is: $\text{Difficulty} = \frac{R}{T} \times 100$

Where R = number of pupils who got the item right.
T = to total number of pupils who tried to answer the question.
W = number of pupils whose answers were wrong.

# Questionnaire in Population Education for Secondary School Teachers

## PART I

*Directions:* Please fill in the blanks or put a check mark (/) in each item below as your answer:

I. General information:

1. Region ________ Division ____________________
   Province ______ District/School ____________
2. Sex: ☐ Male ☐ Female
3. Marital status:
   - ☐ Single
   - ☐ Married
   - ☐ Separated/Widowed
4. Ages:
   - ☐ 20-25 years old
   - ☐ 26-30 years old
   - ☐ 31-35 years old
   - ☐ 36-40 years old
   - ☐ 41-45 years old
   - ☐ 46 and above
5. Educational qualification:
   - ☐ E.T.C. - B.S.E.
   - ☐ B.S.E.
   - ☐ Bachelor with MA Units
   - ☐ MAT/MA.Ed./MA Graduate
   - ☐ With Ph.D. Units
   - ☐ Others (please specify)

     ______________________

     ______________________
6. Teaching experience:
   - ☐ 1-3 years
   - ☐ 4-6 years
   - ☐ 7-9 years
   - ☐ 10-12 years
   - ☐ 13 and above

7. Number of years of teaching population education:

☐ 1-3 years
☐ 4-6 years
☐ 7-9 years
☐ 10-12 years
☐ 13 and above

8. Population education in-service training attended:

| Type of training | Duration of training | Year attended |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |

9. Other sources of population education information aside from formal trainings:

☐ Television
☐ Radio
☐ Newspaper/Magazine
☐ Others, please specify

____________________________
____________________________

10. How much moral support do you get from your administrators concerning population education?

☐ very much
☐ much
☐ moderate
☐ little
☐ not at all

11. How supportive or favourable towards population education is the community where your school is located?

    ☐ very much
    ☐ much
    ☐ moderate
    ☐ little
    ☐ not at all

12. How favourable are the other teachers in your school towards population education?

    ☐ very much
    ☐ much
    ☐ moderate
    ☐ little
    ☐ not at all

## PART II

*Directions:* Answer each of the questions by putting a check mark (✓) before the letter which indicates the correct or best answer.

1. The population of the Philippines is:

____ (a) 50 million
____ (b) 52 million
____ (c) 54 million
____ (d) 56 million

2. The population of the Philippines is growing at the rate of 2.2 per year. At this rate, the population will double itself in:

____ (a) 30 years
____ (b) 32 years
____ (c) 34 years
____ (d) 36 years

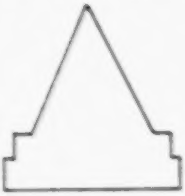
3. Which of the following lists of countries shows a population ranging from largest to smallest.

____ (a) Philipines, Thailand, Indonesia
____ (b) Indonesia, Thailand, Philippines
____ (c) Thailand, Philippines, Indonesia
____ (d) Indonesia, Philippines, Thailand

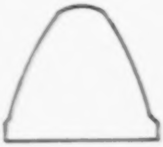
4. Which of the following group of factors must be known to estimate the population of few years, hence;

____ (a) birth rate, family size, death rate
____ (b) birth rate, death rate, migration rate
____ (c) birth rate, infant mortality rate, death rate
____ (d) birth rate, family size, infant mortality

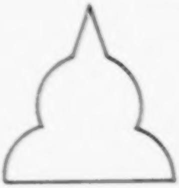
5. Which of the following shapes of the population pyramid represent that of a country which has been a developed country for a number of years?



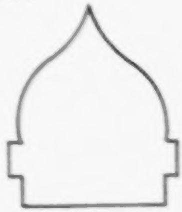
____ A



____ B



____ C



____ D

6. The difference between the birth rate and the death rate is called the rate of:

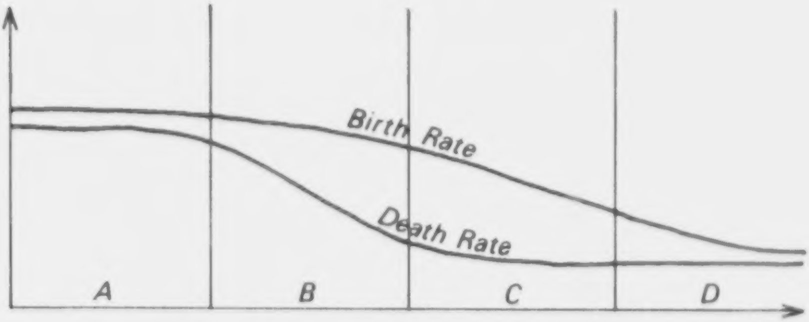
____ (a) growth ____ (c) natural increase
____ (b) population growth ____ (d) fertility

7. To compute the growth rate of the population of a country one must know the natural increase and

____ (a) migration rate of the nationals.
____ (b) migration rate of the foreigners.
____ (c) net-migration rate.
____ (d) number of Balik-bayans (country home visit) coming during the year.

8. Which of the following groups of demographic factors is indicative of a developed country?

____ (a) very high birth rate, very high death rate, high infant mortality rate.
____ (b) high birth rate, low death rate, very low infant mortality rate.
____ (c) low birth rate, very low death rate, very low infant mortality rate.
____ (d) very low birth rate, low death rate, very low infant mortality rate.



9. Which of the sectors in the graph above indicates a country which has not entered the transition stage?

____ (a) A ____ (c) C
____ (b) B ____ (d) D

10. Three of the consequences of rapid population growth are:

    ____ (a) land hunger, industrialization, overcrowding of schools.

    ____ (b) land hunger, unemployment, overcrowding of schools.

    ____ (c) unemployment, overcrowding of schools, industrialization.

    ____ (d) industrialization, high school drop out rate, high mortality rate.

11. A large labour force which is a consequence of rapid population growth in developing countries does not always mean greater output. Which of the following statements best explains this?

    ____ (a) A large labour force encourages workers to be idle because many share a job which can ordinarily be done by a few.

    ____ (b) A large labour force in excess of the number of jobs available creates the twin problems of unemployment and underemployment.

    ____ (c) A larger unskilled labour force generally implies low output qualitatively and quantitatively.

    ____ (d) Stiff competition over jobs discourages people from doing their best.

12. Which of these statements does not reflect the impact of rapid population growth on the human environment?

    ____ (a) The pressure on natural resources causes scarcities.

    ____ (b) Cities became large and full of slums.

    ____ (c) High unemployment.

    ____ (d) Low dependency ratio.

---

13. The term "carrying capacity" of the ecosystem is *best* explained by:

____ (a) its capacity to carry a large population.

____ (b) its capacity to provide the basic necessities.

____ (c) its capacity to continue to bear the pressures of population, etc. without destruction of the regenerative capabilities.

____ (d) its capacity to absorb pollutants.

14. The immediate goal of population education is to:

____ (a) stress family planning as a mean of regulating fertility behaviour.

____ (b) slow down population growth.

____ (c) provide background information for rational responsible behaviour concerning population related matters.

____ (d) adopt a two-child family norm.

15. The statement which best describes family planning is:

____ (a) the limiting of the number of children.

____ (b) a way of ensuring a high quality of life for the family.

____ (c) not allowing unwanted children.

____ (d) spacing the birth of children.

16. Which of the following best gives the meaning of the quality of life in the population education context?

____ (a) Having the basic necessities and the important aids to modern living.

____ (b) Enjoying life that is free from the cares of looking after too many children.

____ (c) Seeing that your children are given all that they desire.

____ (d) Being able to lead a healthy, comfortable and cultured life.

17. Which of the following is *not* a consequence of rapid population growth?

____ (a) Overcrowding of classrooms and the lowering of the quality of teaching.

____ (b) Increase of the dropout rate because of the lack of care given to pupils.

____ (c) The recruitment of more teachers to meet the increase in school-age population.

____ (d) The creation of more opportunities for higher education.

18. The biological capability of a woman to have children at a future time within her reproductive age is referred to as:

____ (a) natality
____ (b) fertility
____ (c) fecundity
____ (d) maternity.

19. Reduction of population growth rate helps the growth of the economy. Which of the following is *not* a consequence of reduced population growth?

____ (a) There will be more savings.

____ (b) More funds will be invested on capital development.

____ (c) Less funds will be spent on education.

____ (d) A lower dependency ratio.

20. Which of the following calorie and protein per day is considered adequate in the Philippines.

____ (a) Male: 2,000 calories, protein 40 grams
Female: 1,800 calories, protein 30 grams

____ (b) Male: 2,200 calories, protein 80 grams
Female: 2,000 calories, protein 70 grams

____ (c) Male: 3,500 calories, protein 150 grams
Female: 3,000 calories, protein 120 grams

____ (d) Male: 4,500 calories, protein 200 grams
Female: 4,000 calories, protein 150 grams

## PART III

*Directions:* Please put a check mark (✓) on the appropriate column to indicate your agreement or disagreement with each statement. The letters are coded as follows:

SA - Strongly, D - Disagree, A - Agree
SD - Strongly disagree, U - Undecided

| Items | SA | A | U | D | SD |
|---|---|---|---|---|---|
| 1. Developing awareness and understanding of population education is the only way to improve the quality of life. | | | | | |
| 2. The best quality of life means enjoying freedom from restrictive mores and traditons. | | | | | |
| 3. Family size should be limited to only two children. | | | | | |
| 4. Having a large family (more than four children) is a good economic insurance for old age. | | | | | |
| 5. The ideal age for marriage is at least 25 years old. | | | | | |
| 6. Population education encourages abortion. | | | | | |
| 7. Sex education is the solution to the rapid population growth of the country. | | | | | |
| 8. Pre-marital sex is favoured by population education. | | | | | |
| 9. Population education hinders good cultural practices and traditional beliefs. | | | | | |
| 10. External migration is a solution to population problems. | | | | | |
| 11. Effective policies for the promotion of general economic well-being is the only key to solving unemployment. | | | | | |
| 12. Population education should be taught as a compulsory subject in the secondary schools | | | | | |

## Work schedule*

| Activities | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May |
|---|---|---|---|---|---|---|---|---|---|---|
| **A. Planning phase** | | | | | | | | | | |
| 1. Determine sampling | — | | | | | | | | | |
| 2. Instruments preparation | — | — | | | | | | | | |
| 3. Administrative arrangements | | — | | | | | | | | |
| 4. Pretest of instrument | | | — | | | | | | | |
| 5. Revision of instruments | | | — | | | | | | | |
| **B. Implementation phase** | | | | | | | | | | |
| 1. Data collection | | | | — | | | | | | |
| 2. Data analysis | | | | | — | — | — | | | |
| **C. Reporting phase** | | | | | | | | | | |
| 1. Writing research report | | | | | | | — | — | — | |
| 2. Dissemination of the research | | | | | | | | | | — |

*The work schedule chart given an indication of time allocation for completing different activities of the study.

## Experimental Design

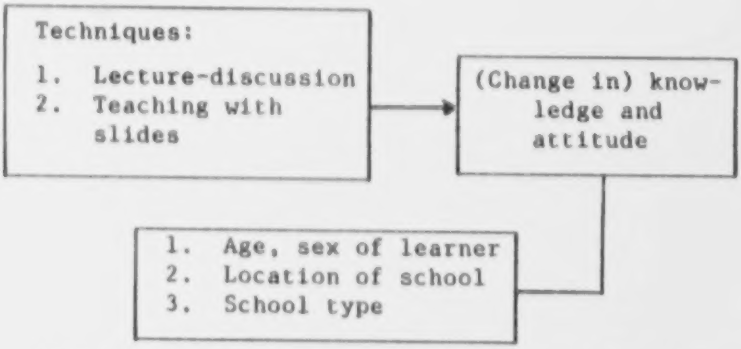
*Title:* The Relative Effectiveness of Two Techniques of Teaching Population Education to Secondary School Students (7th Grade)

**Rationale.** Although there is a wide array of teaching techniques, only a few evaluative researches have been conducted to assess the relative effectiveness of one method *vis-a-vis* other methods, as far as population education is concerned. Hence, this proposed study.

**Objectives.**

1. To measure the effects of using (i) lecture-discussion, and (ii) teaching with slides on the knowledge and attitude of students.
2. To determine if there is a significant relationship between respondents' demographic characteristics and type of school, on the one hand, and their knowledge and attitude concerning population, on the other.

**Conceptual framework.** Illustrated below is the conceptual framework of the study:


Techniques:
1. Lecture-discussion
2. Teaching with slides
(Change in) knowledge and attitude
1. Age, sex of learner
2. Location of school
3. School type

**Scope.** Focus will be on the concepts of population growth and economic development. These are as follows: (i) Population trends in the community; (ii) Effects of rapid population growth on the age structure of a community; (iii) Implications of young population on the economic development of the community; and (iv) Relation between per capita income and economic development.

*Procedure.* Materials about the concepts will be taught to the four groups by the same teacher for one month.

The pretest will be administered to the first group before it is exposed to teaching with slides. The second group will also be given a pretest, then subjected to lecture-discussion. Both groups will take the post-test. The third group will be exposed to teaching with slides while the fourth group will have lecture-discussion, and both groups will take the post-test.

The research instruments will be knowledge and attitude tests covering the topics on population growth and economic development.

*Hypotheses.*

i) The mean scores of students exposed to teaching population education with slides will differ from those taught by lecture-discussion;

ii) There are differences in the attitudes of students in the two groups toward certain population issues; and

iii) There are significant relationships between the respondents' demographic characteristics and type of schools, on the one hand and their knowledge and attitude on the other.

It is expected that the results of the study will show the relative effectiveness of the two techniques on knowledge gain and the development of attitudes in seventh grade students.

*Methodology.*

1. The study will use the multiple group, alternate pretest-post-test design which is illustrated on the following page:

| | | | Time → | |
|---|---|---|---|---|
| Experimental Group$_1$ | (R) | $O_1$ | X | $O_2$ |
| Control Group$_1$ | (R) | $O_3$ | ~X | $O_4$ |
| Experimental Group$_2$ | (R) | | X | $O_5$ |
| Control Group$_2$ | | | ~X | $O_6$ |

Legend: $O_1$ and $O_3$ are pretests.
$O_2$, $O_4$, $O_5$ and $O_6$ are post-test.
X = teaching with slides.
~X = lecture-discussion.

The design is sometimes called the Solomon four-group design. It is chosen because the pretest will serve as an initial measure on which to base change or gain in knowledge and attitudes of the respondents subjected to two teaching techniques. Practice test effects or test sensitization which may affect the post-test (if any) can also be observed by comparing the post-test scores of the four groups.

The design stresses these two criteria: (i) randomization, and (ii) presence of a comparison group (control and experimental).

*Subjects.* The subjects of this study are seventh grade secondary school students. Two hundred students will be randomly selected in one school. The 200 students will be randomly divided into four groups, then randomly assigned to $E_1$, $C_1$, $E_2$ and $C_2$ groups.

*Instrumentation.* In preparing the research instruments, a table of specifications was used (see Table 3). Likewise, after the experimental trial use of the research instruments, item analysis was done (Tables 4 and 5). The research instruments were revised accordingly, *inter alia* on the basis of the findings of the item analysis. The revised research instruments are attached.

## Table 3. Specifications

| Content | Item number on knowledge | | | | | | | | | | | | | | | | | | | | Total | Item number on attitude | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Population growth and economic development | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 1. Population trends in the community | | 1 | | | | | 1 | | | | | | | | | | 1 | 1 | 1 | 1 | 6 | | | 1 | | | | | | | | 1 |
| 2. Effects of RPG on the age structure of a population | 1 | | | | | | | 1 | | | | | 1 | 1 | | | | | | | 4 | | | | | 1 | | | | | 1 | 2 |
| 3. Implication of young population on the economic development of the community | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | | | 1 | | | | | | 8 | 1 | 1 | | 1 | | 1 | | 1 | 1 | | 6 |
| 4. Relation between per capita income and economic development | | | | | | 1 | | | | | | | | | | 1 | | | | | 2 | | | | | | | 1 | | | | 1 |
| Grand total | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |

Table 4. Summary of item analysis on knowledge

| Item No. | Option | | | | Difficulty Level |
|---|---|---|---|---|---|
| | A | B | C | D | |
| 1 | ㊶ | 3 | 5 | 1 | 82% |
| 2 | 4 | 15 | ㉑ | 10 | 42% |
| 3 | 1 | ㉙ | 6 | 14 | 58% |
| 4 | 0 | ㉘ | 21 | 1 | 56% |
| 5 | 8 | ⑳ | 7 | 15 | 40% |
| 6 | 9 | ㉕ | 5 | 11 | 50% |
| 7 | 6 | 3 | ㉟ | 6 | 70% |
| 8 | ㉛ | 4 | 1 | 14 | 62% |
| 9 | 12 | 4 | 8 | ㉖ | -52% |
| 10 | 13 | 10 | 4 | ㉓ | 46% |

Because the difficulty level of item number 1 is high (82 per cent), this particular item was revised.

Table 5. Summary of item analysis on attitude

| Item No. | Option | | | Mean Scores |
|---|---|---|---|---|
| | A(3) | U(2) | D(1) | |
| 1 | 35 | 5 | 10 | 2.5 |
| 2 | 43 | 4 | 3 | 2.74 |
| 3 | 23 | ⑰ | 10 | 2.26 |
| 4 | 37 | 7 | 6 | 2.62 |
| 5* | 9 | ⑭ | 27 | 2.36 |
| 6* | 30 | ⑫ | 8 | 1.56 |
| 7 | 34 | 10 | 6 | 2.56 |
| 8 | 40 | 6 | 4 | 2.72 |
| 9 | 36 | 9 | 5 | 2.62 |
| 10* | 11 | 6 | 33 | 2.44 |

In view of the fact that the mean score for item number 6 is 1.56, it was deemed necessary to revise the item.

## PART I

### Test in Population Education

Name: ______________________ Age: _____ Sex: _____

School: __________________________________________

*Directions:* Encircle the letter of the correct answer.

1. When population growth is rapid, a country has a:

   a) higher percentage of young people.
   b) higher percentage of older people.
   c) higher proportion of working adults.
   d) large labour force.

2. Rapid population growth will also:

   a) help the country to produce more resources.
   b) improve quality of life.
   c) decrease per capita income.
   d) increase food production.

3. The effect of a high dependency burden on the economic status of a community calls for:

   a) increased savings.
   b) more jobs.
   c) higher taxes.
   d) high level of income.

4. The age group 15 and below in a population is called:

   a) working group.
   b) young dependents.
   c) school going population.
   d) old dependents.

5. The proportion of dependent group to the working group is called:

   a) young dependency ratio.
   b) dependency ratio.
   c) unemployment rate.
   d) employment rate.

6. The annual national income is called:

   a) per capita income.
   b) gross national product.
   c) national savings from expenditures.
   d) total tax-returns.

7. There is increase in population, if:

   a) birth and death rates remain the same.
   b) both birth and death rates decrease.
   c) the birth rate increases and the death rate decreases.
   d) the birth rate decreases and the death rate increases.

8. A population with a young age structure will result in:

   a) high dependency burden.
   b) low dependency burden.
   c) increased death rate.
   d) increased birth rate.

9. The effects of reduced birth rate in the community is that:

   a) the proportion of children to adults is reduced.
   b) public and private savings increases.
   c) number of dependents increases.
   d) dependency ratio becomes low.

10. A population problem exists, if:

    a) the annual growth rate is low.
    b) the population grows faster than the resources to maintain that population.
    c) the cost of living increases every day.
    d) the population settles in urban areas.

11. When there are more and more young people in the community it means:

    a) economic development will be faster.
    b) dependency ratio will be low.
    c) more jobs will be needed.
    d) per capita income will increase.

12. When the population of a community is getting younger, which of these may result?
    a) more money spent for the education of its population.
    b) high rate of development.
    c) low dependency ratio.
    d) better job opportunities.

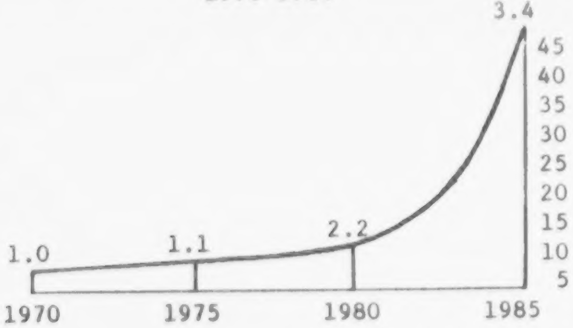
13. What is the effect of rapid population growth on the number of school children?
    a) The larger the population, the larger the number of school children.
    b) The larger the population, the smaller the number of school children.
    c) The increase in population does not affect the number of school children.
    d) The increase in population affects the number of school children.

14. Rapid population growth in a community means:
    a) Young people are increasing faster than old people.
    b) Old people are increasing faster than young people.
    c) All age groups are increasing fast.
    d) Some age groups are increasing, others are decreasing.

15. If a community has a growing young population, it will need:
    a) less money on public facilities.
    b) more housing projects.
    c) better schools.
    d) less money spent on health projects.

16. To increase the per capita income of a community, there is a need to:
    a) lower the population growth rate.
    b) step-up economic development.
    c) improve the educational level of the people.
    d) all of the above.

Population Growth in Community A
1970-1985



17. The graph above shows the first doubling of population in the year:

    a) 1970
    b) 1975
    c) 1980
    d) 1985

18. Which of the following statements best describes Community A's population growth from 1970 to 1985?

    a) Growth is slow.
    b) Growth is fast.
    c) Growth is uniform.
    d) There is no trend.

19. The graph above shows that there is a high dependency burden because of:

    a) young age group.
    b) working group.
    c) adult group.
    d) formal group.

20. Which statement is true?

    a) It took less time for the population to double.
    b) There is no definite time for doubling the population.
    c) It took 10 years for the population to double.
    d) Doubling time is not seen in the above graph.

## PART II

*Directions:* These are some statements of opinions held by people. Read each statement carefully. Opposite each statement you will find three responses. Check the appropriate column which represents how you feel about each statement.

| Item | Agree | Undecided | Disagree |
|---|---|---|---|
| 1. I think the economic growth of my community will slow down if population grows too fast. | | | |
| 2. Housing is usually a problem in an over-crowded city. | | | |
| 3. City life offers more attractions than rural life. | | | |
| 4. If population grows too fast unemployment is likely to be a serious problem. | | | |
| 5. I do not think over-crowding will give rise to crimes. | | | |
| 6. As the population grows fast, life becomes better because there is fast economic growth. | | | |
| 7. Per capita income will increase with greater agricultural production. | | | |
| 8. If the children in a country increase too fast, it will be difficult to give all of them a good education. | | | |
| 9. Rapid population growth is one of the major causes of unemployment among poorer socio-economic groups in any community. | | | |
| 10. We do not need to worry about population growth since there is enough food for the people. | | | |

## Work Schedule*

| Activities | Months | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | V | $V_1$ |
| A. Planning phase | | | | | | |
| 1. Determine sample | — | | | | | |
| 2. Prepare design and instruments | — | | | | | |
| 3. Train teachers and supervisors | — | | | | | |
| 4. Pretest instruments | | — | | | | |
| 5. Revise instruments | | — | | | | |
| B. Implementation phase | | | | | | |
| 1. Administer pretest to two groups (experimental and control) | | | — | | | |
| 2. Teach using lecture-discussion approach to two groups; teach with slides to the other two groups | | | — | — | | |
| 3. Administer post-test to the four groups | | | | — | | |
| 4. Check the test papers on knowledge and attitude | | | | — | | |
| 5. Tabulate data | | | | — | | |
| C. Analysis phase | | | | | | |
| 1. Analyze data | | | | | — | |
| 2. Write research report | | | | | — | |
| D. Reporting phase | | | | | | |
| 1. Print report | | | | | | — |
| 2. Disseminate report | | | | | | — |
| 3. Present findings at a conference | | | | | | — |

*The work schedule chart gives an indication of time allocation for completing different activities of the study.

## Quasi-Experimental Design

*Title:* An Evaluation of an Innovative Approach to In-Service Training of Middle School Teachers of Population Education

**Rationale**. There is a dearth of good evaluative research studies in the field of population education. For a sensitive area like population education, teacher training is an essential pre-requisite. Innovations in teacher training programmes will stimulate and enhance the quality of teaching. Hence, there is a continuing need to search for innovations in the teacher training programme which would instil confidence among teachers for effective teaching of population education.

Though many innovative approaches have been identified, most of them have not been evaluated; hence, teacher trainers, policy/decision makers and users are not cognizant of their value. The present study is an attempt to determine the effectiveness of one such approach so that it could be widely disseminated later.

**Objective**.

a) *General.* To ascertain the effectiveness of an innovative approach in the in-service training of middle school teachers of population education.

b) *Specific.*
   i) To assess the enhancement of the competence of teachers trained by this innovative approach in terms of knowledge, attitude and teaching skills.
   ii) To determine if repeated testing prior to training affects the training outcome.

**Conceptual framework**. The continuum of traditional versus innovtive training modality is presented below:

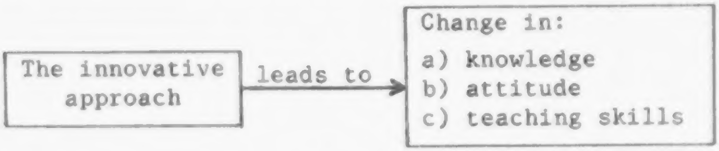
| *Traditional* | | *Innovative* |
|---|---|---|
| Trainer-centered | ↔ | Trainee-centered |
| Trainee passive | ↔ | Trainer as facilitator |

| *Traditional* | | *Innovative* |
|---|---|---|
| Memorization-doling out of factual information | ↔ | Concept attainment |
| "Chalk talk" lecture | ↔ | Problem solving |
| Use mainly textual materials | ↔ | Use variety of learning materials |
| Theory focused | ↔ | Theory, application and practice focused |
| Learning in classroom only | ↔ | Classroom and surrounding environment |

Among the innovative training modalities envisioned for this study are group discussion, role-playing, field trip and the use of flash cards, charts and posters.

The present study seeks to determine how effective is the innovative approach. It assumes that if an approach is really effective, its results would show up consistently.

Since randomization is not feasible, this study will use a quasi-experimental design using three groups and one treatment. The research framework is as follows:



The independent variable is the treatment, i.e. the innovative approach.

The dependent variables are: (a) knowledge, (b) attitude, and (c) teaching skills.

The research design to be used is as follows:

| | Time → | | | | | | |
|---|---|---|---|---|---|---|---|
| Group I | $O_1$ | X | $O_2$ | | | | |
| Group II | $O_3$ | | $O_4$ | X | $O_5$ | | |
| Group III | $O_6$ | | | | $O_7$ | X | $O_8$ |

where $O_1$, $O_3$ and $O_6$ are the initial pretests
$O_2$, $O_5$ and $O_8$ are the post-tests
X is the treatment (innovative approach)

The treatment X is effective if:

$$O_2 > O_1$$
$$O_5 > O_4$$
$$O_8 > O_7$$

There are effects of practice, maturation and/or contamination if:

$$O_4 > O_3$$
$$O_7 > O_6$$

If $O_2$ does not differ much from $O_4$ nor if $O_5$ is not much different from $O_7$, then the treatment is ineffective.

*Hypotheses.*

1. The mean score on the post-test of each group is higher than the corresponding pretest mean score. That is:

   Group I: $M_2 > M_1$
   Group II: $M_5 > M_4$
   Group III: $M_8 > M_7$

   Where M's are mean score.

2. There are no practice effects resulting from repeated pretests, that is:

   Group II: $M_4 = M_3$
   Group III: $M_7 = M_6$

*Methods and procedures.* Three groups of teachers, each consisting of 50 will be identified for training as per the schedule of the training programme of the implementing agency. The duration of training for each group will be seven days, but with some definite time intervals. The first group will undergo training for a week. During that time, the innovative approach will be used.

At the end of the seven-day training programme, the first group will be given a post-test. The same pretest and post-test instrument will be administered to Group II just before the group undergoes the same seven-day in-service training. At the end of the seven-day training, the group will be given a post-test. At about the same time, the third group will be administered the same instruments, and just before the group undergoes the same training programme as the first two groups. Like the first two, the third group will be given a post-test.

In all three groups, gains in scores (difference between immediate pretest and post-test) will be analyzed. For the latter two groups, the gain in scores between the first pretest and the pretest immediately before the treatment will be analyzed to try to account for effects of testing and maturation.

*Instruments.* Three sets of instruments to assess knowledge, attitudes and skills of the teachers shall be used. The first instrument designed to measure knowledge and knowledge gains in population education, consists of about 30 multiple-choice items. The second instrument designed to assess attitudes towards population education consists of about 20 Likert Scale items. The third instrument, a self-perception scale to ascertain development of teaching skills, is a five-point scale ranging from "very much" to "none at all".

Table 6. Specifications

| Content/ core message | Knowledge | | Attitude | Skills practice/ behavioural teaching skills* | Total |
|---|---|---|---|---|---|
| | Concept | Decision-making | | | |
| 1. Family size and family welfare | 5 | 7 | 7 | | 19 |
| 2. Delayed marriage | 1 | | 3 | | 4 |
| 3. Responsible parenthood | 1 | | 3 | | 4 |
| 4. Population and development | 3 | | 4 | | 7 |
| 5. Others | 3 | | 6 | 8 | 17 |
| Total | 13 | 7 | 23 | 8 | 51 |

Table 7. Item analysis: Knowledge test

| Knowledge concept | A | B | C | D | Percentage of correct answers | Remarks |
|---|---|---|---|---|---|---|
| 1. Census | ㉔ | | | | 100.00% | Too easy |
| 2. Dependency | | 1 | | ㉓ | 95.8% | Too easy |
| 3. Zero population growth | 4 | ⑯ | 3 | 1 | 66.67% | |
| 4. Mortality rate | 1 | ⑳ | 2 | 1 | 83.33% | Too easy |
| 5. Birth spacing | 3 | 1 | | ⑳ | 83.33% | |
| 6. Objective of population education teaching fertility | 1 | ① | 2 | 20 | 4.16% | |
| 7. Fertility | ⑩ | 14 | | | 41.67% | |
| 8. Breast-feeding | ⑱ | 1 | 2 | 3 | 75.00% | |
| 9. Responsible parenthood | 2 | ㉒ | | | 91.67% | Too easy |
| 10. Indicator of economic development | ㉑ | 1 | | | 87.50% | |
| 11. Doubling of population | 5 | ⑦ | 4 | 8 | 29.17% | |
| 12. Population pyramid | 11 | 6 | 1 | ⑥ | 25.00% | |
| 13. Natural increase | 11 | 6 | ⑦ | | 29.00% | |
| 14. Demographic factors | | 3 | 16 | ⑦ | 29.17% | |
| 15. Consequences of rapid population growth | | ㉖ | | | 100.00% | Too easy |
| 16. Impact of population growth on environment | 1 | 1 | 4 | ⑱ | 75.00% | |
| 17. Ecosystem | 1 | 6 | ⑰ | | 70.83% | |
| 18. Goal of population Education | 2 | 2 | ⑳ | | 83.33% | |
| 19. Defining family planning | 2 | ⑮ | | 7 | 62.50% | |
| 20. Quality of life | | | | ㉖ | 100.00% | Too easy |

The test items that are either too easy or too difficult were revised accordingly.

## Table 8. Item analysis

### Attitude Test

| Item | Frequency of choice | | | | | Mean Rating | Remarks |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | | |
| 1. Effect of population growth on economy. | 13 | 11 | 0 | 0 | 0 | 4.54 | should be revised in view of the low variance in responses. |
| 2. Family size effect on undernourishment.* | 1 | 10 | 0 | 8 | 4 | 2.71 | |
| 3. Children are needed to help the parent in farm work. | 2 | 8 | 0 | 11 | 3 | 2.79 | |
| 4. Rapid industrialization solves population problem. | 4 | 9 | 2 | 8 | 0 | 3.25 | |
| 5. The family planning programme must be stopped. | 1 | 0 | 0 | 13 | 10 | 1.71 | |
| 6. A big family cannot give all its children a good education. | 6 | 10 | 1 | 4 | 3 | 3.5 | |
| 7. Rapid population growth will weaken our country. | 3 | 7 | 0 | 13 | 1 | 2.92 | |
| 8. Women who work outside the home prefer to have small families. | 11 | 13 | 0 | 0 | 0 | 4.46 | should be revised in view of the low variance in responses. |
| 9. Pollution is largely a problem of poor countries. | 2 | 10 | 0 | 9 | 3 | 2.92 | |
| 10. Birth control is the final solution to the population problem. | 8 | 12 | 2 | 2 | 0 | 4.08 | |
| 11. Population education improves the quality of life. | 9 | 12 | 0 | 2 | 1 | 4.08 | |
| 12. Tradition affects the quality of life. | 1 | 12 | 2 | 8 | 1 | 3.17 | |

| Item | Frequency of choice | | | | | Mean Rating | Remarks |
|---|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | | |
| 13. The ideal age for marriage is 25 years. | 6 | 17 | 0 | 0 | 1 | 4.13 | |
| 14. Abortion should be legalized. | 2 | 0 | 1 | 10 | 11 | 1.83 | |
| 15. Sex education solves the population problem. | 2 | 16 | 0 | 6 | 0 | 3.58 | |
| 16. Pre-marital sex is acceptable. | 0 | 2 | 4 | 15 | 3 | 2.21 | |
| 17. Greater economic production solves the problem of developing countries. | 7 | 15 | 0 | 2 | 0 | 4.13 | |
| 18. External migration causes more problems. | 0 | 13 | 5 | 5 | 1 | 3.25 | |
| 19. Effective economic policies solve undernourishment. | 6 | 16 | 1 | 0 | 1 | 3.79 | |
| 20. Better teachers of population education improve the future quality of life. | 8 | 16 | 1 | 0 | 1 | 4.17 | |

Legend:

SA = 5

A = 4

U = 3

D = 2

SD = 1

*Negatively-oriented items; the scoring was reversed in getting the composite score.

## Background Information

1. Name ______________________________

2. School ______________________________

3. Sex: ☐ Male ☐ Female

4. Age ____________

5. Civil status:
   - ☐ Single
   - ☐ Married
   - ☐ Divorced
   - ☐ Widowed

   - ☐ Under 20
   - ☐ 21-25
   - ☐ 26-30
   - ☐ 31-35
   - ☐ 36-40
   - ☐ 41-45
   - ☐ 46-50
   - ☐ above 50

6. Religion:
   - ☐ Christianity
   - ☐ Hinduism
   - ☐ Islam
   - ☐ Buddhism
   - ☐ Others, please spcify ____________

     ______________________________

7. Teaching qualifications
   - ☐ B.Ed./B.Sc.
   - ☐ Certificate for teaching/advanced
   - ☐ Certificate for teaching/primary
   - ☐ Local certificate for teaching
   - ☐ None

8. Teaching experience:
   - ☐ Less than two years
   - ☐ 3-5 years
   - ☐ 6-9 years
   - ☐ 10 and more

9. Subjects teaching:
   - ☐ M/Language
   - ☐ Environmental studies
   - ☐ Mathematics
   - ☐ Social studies
   - ☐ English language
   - ☐ Others, please specify ____________

     ______________________________

## PART I

## Knowledge Test

*Directions:* Put a check mark (/) before the best answer in each of the following items.

1. A count of the population in a given place at a given time is known as a population
   - a) census
   - b) sampling
   - c) estimate
   - d) projection

2. A country has a high dependency group if it has a big population.
   - a) under 15 years of age
   - b) 65 years of age and over
   - c) between 45 and 65 years of age
   - d) both under 15 years of age and 65 years of age and above

3. Supposing you read in a newspaper that country X has a zero population growth, what does it mean?
   - a) The population of country X is decreasing.
   - b) Its number of people remains the same.
   - c) Less people are born than those who die in country X.
   - d) Nobody is dying in country X.

4. Which of the following groups has the highest death rate?
   - a) children
   - b) infants
   - c) working fathers
   - d) mothers of reproductive age

5. Spacing of births results in:
   - a) proper nutrition of mother and child
   - b) lower infant mortality rate
   - c) lesser incidence of defective children
   - d) all of the above

6. The main objective of teaching population education to young children is to help them:

   a) know about population problems
   b) form desirable attitudes about population issues
   c) be prepared for married life
   d) all of the above

7. Which of these refers to the biological capacity of a woman to reproduce?

   a) Fertility
   b) Fecundity
   c) Heredity
   d) Morbidity

8. A breast feeding mother generally conceives later than women who do not breast feed because:

   a) her ovulation is delayed
   b) she is sexually ineffective
   c) she is too busy attending to the nutrition of her baby
   d) she is not healthy enough

9. "Responsible parenthood" means:

   a) complete control of all the activities of the family
   b) achieving quality of life for all members of the family
   c) allowing maximum freedom to all members of the family
   d) having enough money to meet the food needs of all members of the family.

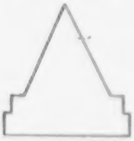
10. Which of these is *not* generally an indicator of economic development?

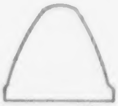
    a) A large dependent population
    b) Improved industrialization
    c) High per capita income
    d) Increased production.

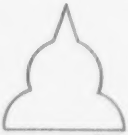
11. The population of the Philippines is growing at the rate of 2.2 per year. At this rate, the population will double itself in

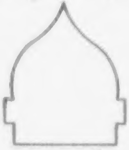
____ a) 30
____ b) 32
____ c) 34
____ d) 36

12. Which of the following shapes of the population pyramid represent that of a developed country.


____ A


____ B


____ C


____ D

13. The difference between the birth rate and the death rate is called the:

____ a) growth rate
____ b) natural population growth
____ c) natural increase
____ d) fertility rate

14. Which of the following groups of demographic factors is indicative of a developed country?

____ a) very high birth rate, very high death rate, very high infant mortality rate.
____ b) high birth rate, low death rate, very low infant mortality rate.
____ c) low birth rate, very low death rate, very low infant mortality rate.
____ d) very low birth rate, low death rate, very low infant mortality rate.

15. Three of the consequences of rapid population growth are:

____ a) land hunger, industrialization, overcrowding of schools.
____ b) land hunger, unemployment, overcrowding of schools.
____ c) unemployment, overcrowding of schools, industrialization.
____ d) industrialization, high school drop out rate, high mortality rate.

16. Which of these statements *best* explains the impact of rapid population growth on the human environment?

____ a) The pressure on natural resources causes scarcities.
____ b) Cities become large and full of slums.
____ c) Unemployment.
____ d) All of the above.

17. The term "carrying capacity" of the ecosystem is best explained by:

____ a) its ability to carry a large population.
____ b) its capacity to support a large population.
____ c) its ability to continue to bear the pressures of pollution, etc. without destruction of the regenerative capabilities.
____ d) its capacity to absorb pollutants.

18. The immediate goal of population education is to:

____ a) stress family planning as a means of regulating fertility behaviour.
____ b) slow down population growth.
____ c) provide background information for national and responsible behaviour concerning population related matters.
____ d) adopt a two-child family norm.

19. The phrase which best describes family planning is:

____ a) limiting of the number of children.
____ b) a way of ensuring a high quality of life for the family.
____ c) not allowing unwanted children.
____ d) spacing the birth of children.

20. Which of the following gives the best meaning of quality of life in the population education context?

____ a) Having the basic necessities and the important aids to modern living.
____ b) Enjoying life that is free from the cares of looking after too many children.
____ c) Seeing that your children are given all what they desire.
____ d) Being able to lead a healthy, comfortable and cultured life.

## PART II

### Attitude Test

Please put a check mark (✓) in the appropriate column to indicate your agreement or disagreement with each of the statements below. The column headings have these meanings:

SA = Strongly agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly disagree

| | SA | A | U | D | SD |
|---|---|---|---|---|---|
| 1. Economic growth in this country will be hindered if population grows too fast. | | | | | |
| 2. Family size is not the major cause of undernourishment among the poorer socio-economic groups in this country. | | | | | |
| 3. For farm families, many children are needed to help the parents in farm work. | | | | | |
| 4. Rapid industrialization is the only answer to solve population problems in a developing country. | | | | | |
| 5. Family planning programme must be stopped immediately because it is against religion. | | | | | |
| 6. In a big family, it is very difficult to give all the children a good education. | | | | | |
| 7. Rapid population growth will weaken the security and defense power of the country. | | | | | |
| 8. Women engaged in jobs outside the home generally prefer to have small families. | | | | | |

| | SA | A | U | D | SD |
|---|---|---|---|---|---|
| 9. Pollution is more a problem of poor countries than rich countries. | | | | | |
| 10. The final solution to the population problem lies in limiting the number of children per couple. | | | | | |
| 11. Developing awareness and understanding of the population situation is the only way to improve quality of life. | | | | | |
| 12. The best quality of life means enjoying freedom from restrictive mores and traditions. | | | | | |
| 13. The ideal age for marriage is at least 25 years old. | | | | | |
| 14. Abortion should be legalized in this country. | | | | | |
| 15. Sex education is the solution to the rapid population growth of the country. | | | | | |
| 16. Premarital sex is now acceptable in society. | | | | | |
| 17. Greater economic production is the best answer to the problems of developing countries. | | | | | |
| 18. External migration causes more problems than internal migration. | | | | | |
| 19. Effective policies for the promotion of general economic well-being is the only key to solving undernourishment. | | | | | |
| 20. Effective teaching of population education will improve the quality of life in the future. | | | | | |

## PART III

## Self-Perception of Teaching Skills

How much difficulty do you find in doing the following teaching activities? Answer by putting a check mark (/) in the appropriate column which matches your answer.

| | Very much | Much | Mod-erate | Little | Not at all |
|---|---|---|---|---|---|
| 1. Writing lesson plans. | | | | | |
| 2. Sustaining interest of the pupils. | | | | | |
| 3. Asking appropriate questions during the lessons. | | | | | |
| 4. Presenting concepts clearly. | | | | | |
| 5. Citing relevant examples to illustrate concepts. | | | | | |
| 6. Encouraging participation of the pupils. | | | | | |
| 7. Maintaining classroom discipline. | | | | | |
| 8. Observing time schedules of the day. | | | | | |
| 9. Diagnosing pupils' difficulties in understanding the concepts. | | | | | |
| 10. Using appropriate visual aids (charts, boardworks, flash cards, etc.) | | | | | |
| 11. Preparing visual aids yourself (charts, boardwork, flash cards, etc.) | | | | | |
| 12. Recapitulating the lesson to assess what the pupils learned during the session. | | | | | |
| 13. Constructing test items. | | | | | |

## PART IV

## Observation Rating Scale for Teaching Skills

Observer ____________________ Class observed ______________

School ______________________ Date and time ______________

Topic taught _______________ No. of students _____________

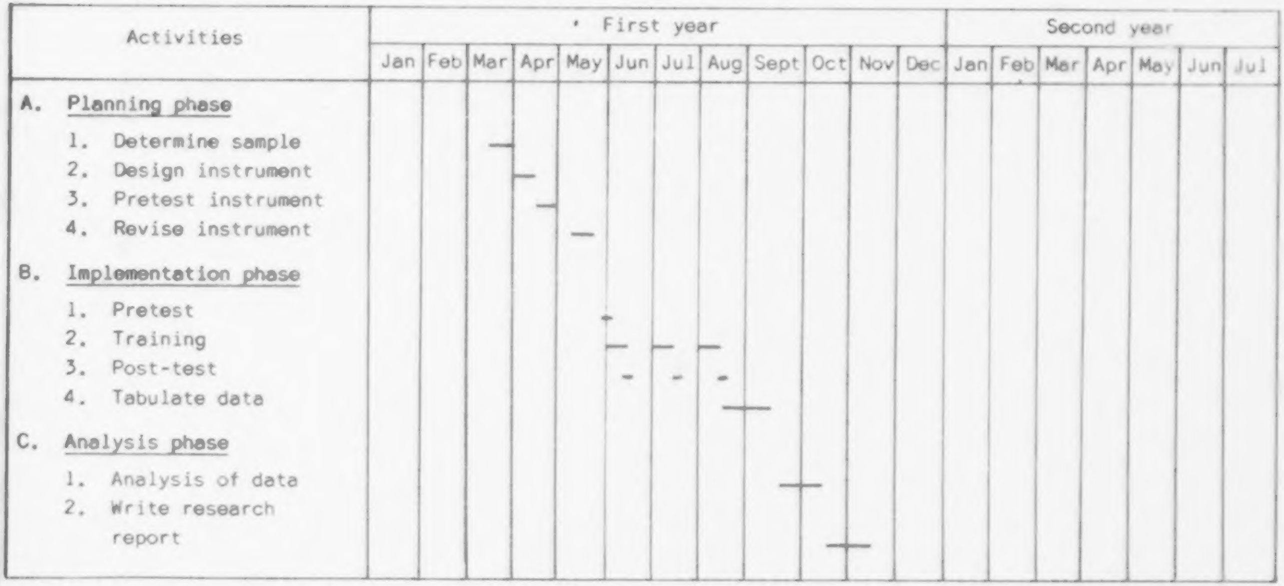
Duration of the period ______________________________________

Please rate the performance of the teacher observed on the following teaching skills by checking (/) the appropriate column.

| | Excel-lent | Very good | Good | Poor | Very poor |
|---|---|---|---|---|---|
| 1. Writing lesson plans.* | | | | | |
| 2. Sustaining interest of the pupils. | | | | | |
| 3. Asking appropriate questions during the lesson. | | | | | |
| 4. Presenting concepts clearly. | | | | | |
| 5. Citing relevant examples to illustrate concepts. | | | | | |
| 6. Encouraging participation of pupils. | | | | | |
| 7. Maintaining classroom discipline. | | | | | |
| 8. Observing time schedule. | | | | | |
| 9. Diagnosing pupils' difficulties in understanding the concepts. | | | | | |
| 10. Using appropriate visual aids, (charts, boardworks, flash cards, etc.) | | | | | |
| 11. Preparing visual aids (charts, boardworks, flash cards, etc.) | | | | | |
| 12. Recapitulating the lesson to assess what the pupils learnt during the session. | | | | | |
| 13. Constructing test items.* | | | | | |

*Please refer to the lesson plans or tests prepared and used by the teacher.

## Work schedule*



| Activities | First year | | | | | | | | | | | | Second year | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul |
| **A. Planning phase** | | | | | | | | | | | | | | | | | | | |
| 1. Determine sample | | | — | | | | | | | | | | | | | | | | |
| 2. Design instrument | | | | — | | | | | | | | | | | | | | | |
| 3. Pretest instrument | | | | — | | | | | | | | | | | | | | | |
| 4. Revise instrument | | | | | — | | | | | | | | | | | | | | |
| **B. Implementation phase** | | | | | | | | | | | | | | | | | | | |
| 1. Pretest | | | | | | — | | | | | | | | | | | | | |
| 2. Training | | | | | | — | — | — | | | | | | | | | | | |
| 3. Post-test | | | | | | — | — | — | | | | | | | | | | | |
| 4. Tabulate data | | | | | | | | — | — | | | | | | | | | | |
| **C. Analysis phase** | | | | | | | | | | | | | | | | | | | |
| 1. Analysis of data | | | | | | | | | — | — | | | | | | | | | |
| 2. Write research report | | | | | | | | | | — | — | | | | | | | | |

*Work schedule chart gives an indication of time allocation for completing different activities of the study.

*Some samples*

## Non-formal population education

The Non-Formal Population Education Group (Group II, Annex B) developed two evaluative research designs, namely (i) an experimental design, entitled "The Relative Effectiveness of Two Modalities of Non-Formal Education Teacher/Tutor Training in Population Education, and (ii) a quasi-experimental design, entitled "Effects of a Non-Formal Population Education Programme on the Knowledge of and Attitude Towards Responsible Parenthood and Family Planning of Adults Attending Literacy Classes in Community X". The evaluative research designs, together with the research instruments are presented below and the pages which follow.

### Experimental design

*Title:* The Relative Effectiveness of Two Modalities of Non-Formal Education (NFE) Teacher/Tutor Training in Population Education

Rationale. Many countries of Asia and the Pacific are concerned about the adverse effects of rapid population growth on quality of life. There is a general recognition that an educational intervention in the form of exposure to population issues and problems could sensitize children, youth and adults to the importance of moderate fertility behaviour. In-school programmes of population education have already been launched in several countries, but there are many youth and adults who have not been exposed to population education for a variety of reasons, and it is necessary to reach them through NFE programmes. For this purpose, it is necessary to train teachers/tutors. In view of the fact that different modalities of training may not be equally effective, it is important for the programme staff to ascertain which modalities are effective.

This study seeks to determine the effectiveness of two popular modalities, namely; face-to-face training and a self-instructional training.

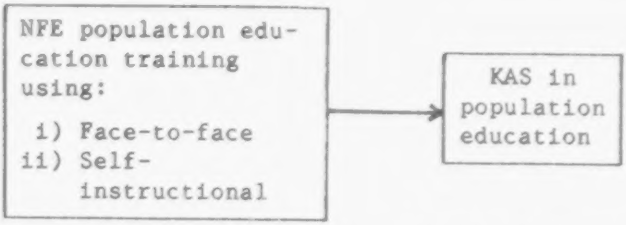
#### Objectives

1. To assess the relative effectiveness of face-to-face training and self-instructional train-

ing of teachers from rural areas to teach population content in NFE programmes; and

2. To identify changes that are necessary in one or the other modality to improve it.

Conceptual framework. After the training, teachers/tutors are expected to acquire knowledge, attitudes and skills (KAS) to teach population content effectively in NFE classes either through integration or as a separate course, the training modalities employed being face-to-face training and self-instructional training scheme. The conceptual framework is illustrated in the model below:


NFE population education training using:
i) Face-to-face
ii) Self-instructional
KAS in population education

Hypotheses. This study posits the following hypotheses:

1. The mean scores in knowledge of NFE teachers/tutors taught through the self-instructional training modality will differ from those trained using the face-to-face modality.
2. Mean scores in attitudes of teachers/tutors trained using self-instructional modality will differ from those of teachers trained in the face-to-face modality.

Methodology. *Design* - Experimental: The true control group, pretest-post-test design will be used in this study. The design is illustrated in the diagram below:

| | | Pretest | | Post-test |
|---|---|---|---|---|
| Self-instructional training | (R) | $O_1$ | X | $O_2$ |
| Face-to-face training | (R) | $O_3$ | ~X | $O_4$ |

Where: $O_1$ and $O_3$ = Pretests

$O_2$ and $O_4$ = Post-tests

X = Self-instructional training modality which is the treatment

~X = Face-to-face training modality, the alternate programme

Variables and measures. The independent variable or the treatment variable in the study is *self-instructional training modality.* This refers to a scheme whereby teachers are trained through self-learning modules in population education. The content of this experimental modality is parallel to that of the usual face-to-face training scheme.

The trainees shall study the materials on their own and this self-study is interfaced with sessions with a trainer for discussions/explanations of learning points and reinforcement of learning through film showing and lectures by resource persons. The duration is two weeks.

The alternate programme is the face-to-face training modality. This is the treatment given to the control group. The scheme is the usual modality by which NFE tutors/teachers are trained. The duration of the training is six to seven days.

The dependent variables are knowledge, attitudes and skills in population education. Knowledge in population education refers to scores in a population education test administered to the trainees. The knowledge items include population information in the areas of the core messages of the national population programme. These are (i) family size and family welfare, (ii) delayed marriage, (iii) responsible parenthood and family planning, and (iv) population and other development concerns. Attitudes in population education refers to scores in an attitude rating scale, administered to the trainees. The attitude items include statements of beliefs and opinions related to population-related issues. Skills in population education refers to ratings of perceptions of help needed by NFE tutors/teachers with regard to certain tasks in teaching population education.

Respondents. One hundred and twenty NFE tutors/teachers randomly selected and assigned to an experimental group (self-instructional) and a control group (face-to-face) shall constitute the respondents of the study.

Sampling. A rural community will be selected from the census blocks using purposive sampling following a set of criteria, e.g. a community with the most number of untrained teachers/tutors, rural community, etc. Afterwards, the 120 teachers/tutors will be chosen from a roster using the table of random numbers.

The selected samples will then be broken into two groups (Experimental and Control) by drawing lots or by tossing a coin. A group of 30 shall constitute a class size. Hence, there shall be two classes in the experimental group and two classes in the control group. Training using self-instructional and the alternate programme shall be conducted simultaneously.

The four trainers who will conduct the simultaneous training programme shall be selected and made comparable in terms of educational qualification, experience in teaching non-formal education, previous training in population education, performance rating and age.

Research instruments. A questionnaire on knowledge, attitude and skills (KAS) in population education is the main instrument for gathering the relevant data.

The following steps will be followed in the preparation of the instrument:

1. Prepare a table of specifications based on the training design for NFE tutors/teachers in order to determine the coverage of the test items.
2. Pretest the instruments on a group similar to the research samples.
3. Revise and finalize the instruments.

The KAS questionnaire is included in this proposal.

## Table 9. Specifications

| Content of training | Number of items | | |
|---|---|---|---|
| | Knowledge | Attitudes | Skills |
| A. Core messages | | | |
| 1. Family size and family welfare | 2 | 4 | |
| 2. Delayed marriage | 1 | 1 | |
| 3. Responsible parenthood and family planning | 2 | | |
| 4. Population and other development concerns | 3 | 2 | |
| B. Demographic concepts | 4 | | |
| C. Population education | | | |
| 1. Teaching methods | 1 | | 10 |
| 2. Evaluation | | | 6 |
| 3. Integration of population education in NFE | 1 | 3 | 5 |
| D. Andragogy | 1 | | 1 |
| Total | 15 | 10 | 22 |

## Table 10. Item analysis of responses to knowledge items

| Items | Facility level % | Response options | | | |
|---|---|---|---|---|---|
| | | a | b | c | d |
| 1 | 33.3 | - | 7 | 3 | ⑥* NR = 1 |
| 2 | 61.1 | - | ⑪ | - | 77 NR = 1 |
| 3 | 44.4 | - | ⑧ | 2 | 8 |
| 4 | 5.6 | 2 | 1 | ① | 14 |
| 5 | 94.4 | 1 | - | ⑰ | - |
| 6 | 27.8 | 4 | 3 | ⑤ | 6 |
| 7 | 22.2 | 2 | - | 12 | ④ NR = 1 |
| 8 | 50.0 | 1 | 3 | 5 | ⑨ |
| 9 | 38.9 | - | ⑦ | 7 | 4 |
| 10 | 94.4 | 1 | - | ⑰ | |

Analysis:

1. Item 4 - the correct response is letter *c*, however, letter *d* appears to be a very attractive option/answer. There is a need to change this alternative response to make it a wrong, but plausible response alternative.
2. Items 5 and 10 are very easy items. These do not discriminate the knowledge level of respondents. There is a need to change the items to more discriminating ones.
3. Item 6 is a difficulut item. However, it is a good pretest item on the concept.

*○ encircled numbers = number who got the correct responses.

Table 11. Item analysis of responses to attitude items

| Items | Response options | | | | | Mean |
|---|---|---|---|---|---|---|
| | SA | A | U | D | SD | |
| 1 | 7 | 5 | 1 | 4 | - | 3.7 |
| 2 - * | 3 | 1 | 5 | 8 | 1 | 3.2 |
| 3 | 10 | 8 | - | - | - | 4.6 |
| 4 - * | 2 | 2 | 5 | 5 | 4 | 3.4 |
| 5 | 5 | 10 | 1 | 1 | 1 | 3.9 |
| 6 | 8 | 9 | - | 1 | - | 4.3 |
| 7 | 11 | 7 | - | - | - | 4.6 |
| 8 | 7 | 10 | 1 | - | - | 4.3 |
| 9 | 8 | 8 | - | 1 | 1 | 4.2 |
| 10 | 3 | 8 | 2 | 2 | 2 | 3.3 |

*Negatively-oriented statements - Scoring was reversed: SD = 5, D = 4, etc.

Analysis:

1. Items 3 and 7 had a high mean attitude rating of between *Agree* and *Strongly agree*. Since there is already a very favourable attitude towards these items, there is a need to change them for more critical issues where there is expected divergent attitudes.
2. The items bordering on *Uncertain* to *Disagree* or *Agree* will be kept as they are significant in terms of programme objectives and goals.

Note: The item numbers mentioned above refer to those item numbers which were used in the instrument developed for trial phase.

## Questionnaire in Population Education for Non-Formal Education (NFE) Teachers/Tutors

Name (optional) ____________________ Age ____ Sex ____
Marital status ______________ Number of children ____
School ______________________________________________
Highest education completed __________________________

Sources of information on population/family planning and related information. Check (✓) those that apply to you.

- ☐ School
- ☐ Radio
- ☐ Television
- ☐ Newspaper
- ☐ Magazine
- ☐ Comic books
- ☐ Films
- ☐ Pamphlets
- ☐ Village leaders
- ☐ Doctors/nurses/midwives
- ☐ Neighbours/friends
- ☐ Own children who are schooling
- ☐ Others (Please specify) ______________

______________________________

### Knowledge

*Directions:* Encircle the letter of the correct answer to each of the items below.

1. What is your understanding of rapid population growth (RPG)?

   a) Many people migrate to the cities.
   b) Many babies are born every day.
   c) Couples are marrying early.
   d) Many babies are born but few people die.

2. A head count of the population that is taken periodically is called a

   a) registration
   b) census
   c) poll
   d) demographic survey

3. When is a woman likely to be most fertile?

   a) During her menstrual period.
   b) At midpoint between menstrual periods.
   c) 3-4 days before menstruation.
   d) 3-4 days after menstruation.

4. What will likely happen if there is a heavy in-migration to one area?

   a) The age structure of that area will become younger.
   b) It will have more resources.
   c) The value of land will decrease.
   d) There will be more old people.

5. What contraceptive method works on the physiological process of suppression of ovulation?

   a) pill
   b) IUD
   c) rhythm
   d) cream and jellies

6. Which of the following statements correctly defines the concept of dependency burden?

   a) The number of non-working children in a family.
   b) The ratio of the working population to the total population.
   c) The ratio of the working population to the young and aged population.
   d) The percentage of the unemployed population.

7. Which of the following phrases defines the concept of "completed family size"?

   a) The total number of living children born to a woman during her reproductive period.
   b) The total number of children born to a woman, including still births.
   c) The total number of members in the nuclear family - father, mother and children.
   d) The number of children ever born to a woman, including those who have died after birth.

8. In which of these characteristics would adult learners differ most from pupils?

   a) Literacy level
   b) Novelty of learning
   c) Motivation to learn new things
   d) Immediate application of most things learned

9. Which of the following tasks would be the first ideal step to take when organizing a class for adult learners?

   a) Write the curriculum.
   b) Assess their learning needs.
   c) Recruit adults to enrol in the class.
   d) Collect/prepare instructional and other materials.

10. A non-formal education lesson on "Values Held by People on Family Size" is best taught using

    a) Film showing
    b) Lecture by a resource person
    c) Role playing
    d) Indoctrination

11. The national population programme is promoting the message of delayed or late marriage for this reason:

    a) to enable young people to finish their schooling.
    b) to limit family size.
    c) to have more mature and responsible parents.
    d) to develop a sense of commitment among young people to a national problem.

12. What does the broad base of a population structure mean?

    a) The population is stable.
    b) There are many young people in the population.
    c) There are more people who die in their adulthood.
    d) There is likely to be high infant mortality.

13. What is the relation of breatfeeding to fertility?

    a) Improves the health of the mother.
    b) Delays ovulation.
    c) Prevents conception.
    d) Decreases sex drive.

14. There are seven children in the Reyes family. The Santos family has three children. Both families have the same income and are about equal in other things. Which family is likely to be more healthy?

    a) Reyes family.
    b) Santos family.
    c) Both families.
    d) It is not possible to say.

15. Who are the most greatly affected in terms of decreased mortality when improved health services are introduced to a country?

    a) Old people.
    b) School-aged population.
    c) Infants.
    d) Young adults.

## Attitude Test

Read carefully the statements numbered 1 to 10. Below each statement, you will find five responses, namely:

SA = Strongly agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly disagree

In respect of each statement, put a cross (X) mark on the appropriate place in each row to describe your agreement or disagreement.

1. Couples should be free to have the number of children they desire.

______ ______ ______ ______ ______
SA A U D SD

2. The first child in the family should be male.

______ ______ ______ ______ ______
SA A U D SD

3. It is difficult to integrate population education in NFE programmes.

______ ______ ______ ______ ______
SA A U D SD

4. A large family is a happy family.

______ ______ ______ ______ ______
SA A U D SD

5. The ideal age of marriage for both men and women should be 25 years.

______ ______ ______ ______ ______
SA A U D SD

6. A good approach to introduce population education to the learners of NFE is through integration with other subjects in NFE programmes.

______ ______ ______ ______ ______
SA A U D SD

7. Many NFE teachers are not willing to teach population because some of its contents are controversial.

______ ______ ______ ______ ______
SA A U D SD

8. If people continue to have large families, the problem of unemployment would become worse.

______ ______ ______ ______ ______
SA A U D SD

9. Fewer number of children will improve the quality of nutrition of family members.

______ ______ ______ ______ ______
SA A U D SD

10. Movement of people from the village to the cities results in insufficient educational facilities for in-migrant children.

______ ______ ______ ______ ______
SA A U D SD

## Skills

A. Please encircle the appropriate number to indicate how much help you feel you need for each of the following tasks:

5 = Very much
4 = Much
3 = Moderately
2 = Little
1 = Not at all

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | Diagnosing/assessing learners' needs in population education in terms of knoweldge attitudes and practices/skills. | 5 | 4 | 3 | 2 | 1 |
| 2. | Selecting appropriate content to meet learners' needs. | 5 | 4 | 3 | 2 | 1 |
| 3. | Identifying points of entry for population education concepts/topics in NFE programmes. | 5 | 4 | 3 | 2 | 1 |
| 4. | Selecting and using existing instructional materials. | 5 | 4 | 3 | 2 | 1 |
| 5. | Preparing/adapting instrucitonal materials. | 5 | 4 | 3 | 2 | 1 |
| 6. | Referring clients to appropriate agencies for needed services. | 5 | 4 | 3 | 2 | 1 |

B. Check (/) the frequency with which you use each of the following teaching methods/strategies according to the scale below:

5 = Very often
4 = Often
3 = Sometimes
2 = Rarely
1 = Never

| Teaching methods strategies | Frequency of use | | | | |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |
| 1. Lecture | | | | | |
| 2. Small group discussion | | | | | |
| 3. Role playing | | | | | |
| 4. Demonstration teaching | | | | | |
| 5. Film showing | | | | | |
| 6. Brainstorming | | | | | |
| 7. Debate | | | | | |
| 8. Panel discussion | | | | | |
| 9. Confrontation | | | | | |
| 10. Field trip | | | | | |
| 11. Others (please specify)<br>______________________<br>______________________<br>______________________ | | | | | |

C. Please encircle the appropriate number to describe the extent of *frequency of your use* of each of the following evaluation approaches/techniques:

1 = Never
2 = Rarely
3 = Sometimes
4 = Often
5 = Very often

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | Knowledge tests | 1 | 2 | 3 | 4 | 5 |
| 2. | Attitude rating scales | 1 | 2 | 3 | 4 | 5 |
| 3. | Observation | 1 | 2 | 3 | 4 | 5 |
| 4. | Interview | 1 | 2 | 3 | 3 | 5 |
| 5. | Questionnaire | 1 | 2 | 3 | 4 | 5 |
| 6. | Self-reports | 1 | 2 | 3 | 4 | 5 |
| 7. | Others (please specify) | 1 | 2 | 3 | 4 | 5 |
| | ______________________ | 1 | 2 | 3 | 4 | 5 |
| | ______________________ | 1 | 2 | 3 | 4 | 5 |
| | ______________________ | 1 | 2 | 3 | 4 | 5 |

## Work schedule*

| | Jan | Feb | Mar | Apr | May | June | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. **Planning phase** | | | | | | | | | | | | |
| 1. Determine sample | — | | | | | | | | | | | |
| 2. Design questionnaire | — | | | | | | | | | | | |
| 3. Orient supervisors and researchers | | — | | | | | | | | | | |
| 4. Pretest questionnaire | | — | | | | | | | | | | |
| 5. Revise/finalize questionnaire | | | — | | | | | | | | | |
| 6. Print required number of copies | | | — | | | | | | | | | |
| 7. Identify and orient NFE trainers for both groups | | | — | | | | | | | | | |
| 8. Assemble needed materials/modules for training | | | | — | | | | | | | | |
| 9. Plan schedule of training with NFE trainers | | | | — | | | | | | | | |
| B. **Implementation phase** | | | | | | | | | | | | |
| 1. Administer pretest | | | | | — | | | | | | | |
| 2. Conduct training programmes (4) | | | | | — | — | | | | | | |
| 3. Administer post-test | | | | | | — | | | | | | |
| 4. Check and record KAS scores | | | | | | — | | | | | | |
| 5. Code data | | | | | | — | — | | | | | |
| 6. Check for consistency | | | | | | | — | | | | | |
| 7. Tabulate data | | | | | | | | — | | | | |
| C. **Analysis phase** | | | | | | | | | | | | |
| 1. Analyze data | | | | | | | | | — | | | |
| 2. Write research report | | | | | | | | | | — | | |
| D. **Reporting phase** | | | | | | | | | | | | |
| 1. Print report | | | | | | | | | | | — | |
| 2. Disseminate report | | | | | | | | | | | | — |
| 3. Present findings to appropriate audiences in conferences | | | | | | | | | | | | — |

*Work schedule chart gives an indication of time allocation for completing different activities of the study.

## Quasi-Experimental Design

*Title:* Effects of a Non-Formal Population Education Programme on the Knowledge of and Attitude Towards Responsible Parenthood and Family Planning of Adults Attending Literacy Classes in Community X.

**Rationale**. Several developing countries in the Asian region which are characterized by rapid rates of population growth and low literacy rates have initiated non-formal population education programmes in recent years. The purpose of these programmes is to create awareness of population-related issues and quality of life concepts among the out-of-school youth and adults. Such awareness in turn is expected to break traditional resistance to population control and create more favourable attitudes towards responsible parenthood and adoption of family planning.

The task that the non-formal population education programme has to achieve is formidable, as a large proportion of the population is illiterate. In many instances, population education content has to be integrated into the adult literacy and functional education programmes. Large sums of money have to be spent in organizing the programme, in the training of teachers, development of training manual, preparation of the content and implementing the programme. Hence, the need for evaluating their impact on the clientele. Taking as an example a small community "X" with an estimated population of about 50,000, the present study is designed to illustrate the various steps involved in the evaluation of a non-formal population education programme.

**The setting**. In the census taken in 1980 in Community "X", the community was characterized by high population growth rates, i.e. about 3 per cent per year. Over the past two decades, the population has been increasing very rapidly due to natural increase as well as in-migration from the surrounding communities. If the growth rate continues, the population of this community shall double in two decades or so.

As a result of socio-economic problems which are already felt and which could get worse, the community leaders have been convinced that along with the development of the resources, a population planning programme for the community is essential. The leaders are aware that the low literacy level of the population in general, and of the adult population in particular, and the traditional pro-natalist attitudes and values existing in the community will be obstacles to the population planning programme. Hence, a non-formal population education programme appears urgent.

An adult literacy campaign has been started in the community to offer a functional literacy course extending over six months for the age group 18 years and above. One hundred adult literacy centres in both rural and urban areas have been opened.

A Team of population education experts has been invited by the community leaders to provide advice on the incorporation of population education concepts into the functional literacy curriculum. The recommendations of the Team include *inter alia* the introduction of non-formal population education and provision of family planning services. Following such recommendations, a non-formal population education programme has been worked out with the help of local experts to introduce population education as part of the adult literacy classes.

The population education programme has been conceptualized to:

1. create awareness of population-related problems in the community;
2. develop an understanding of the relationship of population and the quality of life of the community; and
3. develop awareness and positive attitudes towards responsible parenthood and family planning.

As an initial step, the training of a group of teachers in population education has been undertaken and a core curriculum in population education developed for use in a selected number of the adult literacy centres.

Teachers' guides were also prepared for the course. These materials are focused on the core messages of population education, namely; (i) community population, (ii) family size and family welfare, (iii) delayed marriage, (iv) responsible parenthood, and (v) population and development.

### Objectives of the study

1. To study the effects of population education integrated into functional literacy classes on the knowledge of adults attending the functional literacy classes.
2. To assess the effects of population education on attitudes towards responsible parenthood and family planning.

**Conceptual framework**. While an experimental study design would be ideal, it is anticipated that a true experimental set-up with randomization, as well as having control and experimental groups, will not be feasible. As an approximation, the quasi-experimental non-equivalent group design has been selected and is illustrated below:

| | | | |
|---|---|---|---|
| Group exposed to both population education and adult literacy. | $O_1$ | X | $O_2$ |
| Group exposed only to adult-literacy. | $O_3$ | | $O_4$ |

The main independent variable in the study is population education integrated in literacy programme; the antecedent variables are age, sex, marital status, occupation, years of urban/rural residence, age at marriage, number of children and extent of attendance in class which will be obtained from the record of the Adult Literacy classes. Knowledge of the community's population problems, quality of life issues, knowledge of family planning and attitudes towards responsible parenthood and family planning will be the dependent variables.

## Research hypotheses

1. Upon completion of the six-month course, the level of knowledge and awareness of population and quality of life issues of those adult literates attending an integrated course of literacy and non-formal population education will be different from that of adults who are only attending the literacy course.

2. After the completion of the six-month course, the attitudes towards responsible parenthood and family planning of the participants in the integrated literacy and non-formal population education course will be different from the participants of literacy course only.

## Methods and procedures

Sample. Ten adult literacy centres (six from rural and four from urban areas) constituting 10 per cent of all centres will be randomly selected from the list of the 100 centres for introduction of the population education contents in the functional literacy curriculum to be taught by trained teachers. A similar number of centres from both the rural and urban areas will constitute the control groups. On the average, each class will consist of 25 participants. Hence, 250 subjects in the treatment group and 250 in the control group will constitute the sample, i.e. approximately 10 per cent of the total participants in each group.

Duration of treatment. The various population concepts and information on population and quality of life, responsible parenthood and family planning will be incorporated in the appropriate sections of the literacy curriculum and will be taught for a period of six months. For the convenience of the adult participants, the teaching sessions will be held in the late afternoons or evenings for one hour a day. Thus, the total teaching hours in the six months shall be 144. Allowing for absenteeism, the average time of exposure of participants to the programme is expected to be about 100 hours.

A record of actual attendance will be maintained to be used as one of the controls in the analysis of data. Before the start of the teaching sessions a pretest will be given to the participants in the ten selected centres who are to be exposed to population education, as well as those constituting the control group. A post-test will be administered to all participants of both the treatment and control groups immediately at the end of the six-month course.

Instrument and administration

1. An information file for each participant will be maintained in the Adult Literacy Centres giving general information on the participants' demographic and socio-economic characteristics.
2. An interview schedule will be prepared for both the pretest and the post-test. The information on knowledge, perception and awareness will be collected through interviews by a group of ten interviewers who shall be trained by the project co-ordinator. Interviews shall be conducted with participants of both the treatment and control groups. Detailed instructions on each item included in the questionnaire will be given in the Manual of Instructions to Interviewers. Ten to 15 interviews are expected to be completed in a day so that each interviewer shall be able to interview 50 participants in two adult literacy centres. The post-course interviews (both individual and group) will be conducted immediately at the end of the course, after the participants would have been exposed to an average of 100 hours of teaching on the population contents integrated in the literacy course.

   Teachers who shall be engaged to interview shall be paid on the basis of the number of interviews completed, both before and after the treatment. Preferably the same interviewers will be engaged for the pre- and post-programme interviews.

Limitation of the design. This evaluative research design on a non-formal population education programme for adults is based on a hypothetical community to illustrate the procedures involved in conducting such a study.

The non-formal population education programmes of various countries will have to alter the design in the light of their unique socio-cultural contexts and needs. The selection of sample and type of questions included in the instruments have to be adapted and made relevant to the actual conditions prevailing in different countries.

It is hoped, however, that the model presented will provide guidelines for designing evaluative studies to assess the effects of imparting population education as integrated in non-formal and/or literacy programmes.

Instrumentation. In preparing the research instruments, a table of specifications was used (Table 12). Likewise, after the expeimental trial-use, the research instruments were revised accordingly. The revised research instruments are attached.

Table 12. Specifications

| Area/concept | Knowledge | Attitude |
|---|---|---|
| 1. Demographic and social characteristics. | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18 | |
| 2. Responsible parenthood and family planning. | 26, 28, 29<br>30-1, 30-11 | 22a, 22b, 22c, 31, 32 |
| 3. Population education and other concerns. | 17, 19, 20 | |

*Evaluative research in population education*

*Instrument:* Interview Schedule

## Identification Sheet

Location of centre: Urban ☐ Rural ☐

Name of village: ______________________________

Address: ______________________________
______________________________

## I. General Information about the Respondent

1. Name: ______________________________
2. Age:
   - 16-20 - ☐
   - 21-25 - ☐
   - 26-30 - ☐
   - 31-35 - ☐
   - 36-40 - ☐
   - 41-45 - ☐
   - 46-50 - ☐
   - 51-55 - ☐
   - 56 and above - ☐
3. Sex: Male ☐ Female ☐
4. Marital status:
   - Never married ☐
   - Currently married ☐
   - Widowed ☐
   - Separated/divorced ☐
5. Age at first marriage: __________ years.
   (NOT APPLICABLE FOR THOSE NEVER MARRIED.)
6. Number of children: __________
   Number of boys: __________
   Number of girls: __________
7. Your occupation: ______________________________
   Occupation of your spouse: ____________________
8. Approximate family income per month: __________
9. Have you had any previous schooling?
   Yes ☐ No ☐

   If yes, how many years? ____________________

10. Religion: ______________________________

11. Do you have a radio in your household?
    Yes ☐ No ☐

    Do you have a television in your household?
    Yes ☐ No ☐

12. Years of rural/urban residence:
    Rural ☐ years Urban ☐ years

*Note:* The above identification sheet on each participant will be maintained in the Adult Literacy Centre for both the pretest and post-test.

## II. Awareness and Perception of Population Problems

1. What is the approximate population of your community?

   ______________________________

2. Do you think your community is overcrowded/over-populated?
   Yes ☐ No ☐ Don't know ☐

3. Approximately how many babies were born to your community in the past year?
   So many ☐ Many ☐ Few ☐
   None ☐ No idea ☐

4. How many people died in your community in the past year?
   So many ☐ Many ☐ Few ☐
   None ☐ No idea ☐

5. (a) How many people have migrated into your community in the past year?
   So many ☐ Many ☐ Few ☐
   None ☐ No idea ☐

   (b) How about the number of people who migrated out of your community?
   So many ☐ Many ☐ Few ☐
   None ☐ No idea ☐

6. How adequate are the resources (food and other amenities of life) of your community for the population?

   Very adequate ☐
   Adequate ☐
   Inadequate ☐
   Very inadequate ☐
   Don't know ☐

7. How adequate is the income of an average family in your community?

   Very adequate ☐
   Adequate ☐
   Inadequate ☐
   Very inadequate ☐
   Don't know ☐

8. What will happen to the supply of food and other basic services in your community if there is a large increase in population?

   ______________________________________________
   ______________________________________________
   ______________________________________________

9. In your opinion which of the following measures would contribute greatly to the quality of life of the people in your community?

   ____ planning family size
   ____ having many children
   ____ trial marriage
   ____ creating more job opportunities
   ____ delaying marriage
   ____ providing more educational facilities
   ____ any other (please specify answer)

   ______________________________________________
   ______________________________________________

## III. Views/Ideas on Age at Marriage, Size of Family, Responsible Parenthood

10. What do you think is the right age for marriage?

    a) for men? __________ years
    b) for women? ________ years

11. a) Do you think mothers should space the births of their children?

Yes ☐ No ☐

b) Why? ____________________

____________________

(If yes) ____________________

____________________

c) What do you think is the ideal spacing between births? __________ years

12. What in your opinion is the ideal number of children a couple should have in your community these days?

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ more than 5 (please specify exact number)

13. What is the number of children you consider *ideal* for your family?

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ more than 5 (please specify exact number)

14. How many boys and how many girls is the ideal number for your family?

____ boys
____ girls

☐ it makes no difference

15. What are the characteristics of responsible parents?

____________________

____________________

____________________

16. When you see a family with many children, how do you feel?

__________________________________________

__________________________________________

__________________________________________

## IV. Knowledge of and Attitudes Towards Family Planning

17. Have you heard of family planning?

Yes ☐ No ☐

18. If yes, what do you understand about family planning?

__________________________________________

__________________________________________

__________________________________________

19. a) Can you name some methods of family planning?

Yes ☐ No ☐

b) If yes, please name the methods.

__________________________________________

__________________________________________

__________________________________________

20. Some couples adopt measures of family planning to space their children. Do you approve of this?

Approve ☐ Disapprove ☐

21. Some couples adopt measures of family planning to limit their family size. Do you approve of this?

Approve ☐ Disapprove ☐

---

Other relevant comments by the respondents. ____________

__________________________________________

__________________________________________

__________________________________________

**Work schedule***

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| Activities | First year | | | | | | | | | | | | Second year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| A. Planning phase | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Determine sample | — | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Design interview schedule | — | — | | | | | | | | | | | | | | | | | | | | | | |
| 3. Recruit interviewers and supervisor | | — | | | | | | | | | | | | | | | | | | | | | | |
| 4. Train interviewers and supervisors | | | — | | | | | | | | | | | | | | | | | | | | | |
| 5. Pretest interview schedule | | | | — | | | | | | | | | | | | | | | | | | | | |
| 6. Revise schedule | | | | | — | | | | | | | | | | | | | | | | | | | |
| B. Implementation phase | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Conduct pretest interviews | | | | | | — | | | | | | | | | | | | | | | | | | |
| 2. Conduct post-test interviews | | | | | | | | | | | | — | | | | | | | | | | | | |
| 3. Code data from pre-test interview | | | | | | | — | | | | | | | | | | | | | | | | | |
| 4. Check for consistency | | | | | | | | — | | | | | | | | | | | | | | | | |
| 5. Key punch data | | | | | | | | | — | | | | | | | | | | | | | | | |
| 6. Tabulate data from pretest | | | | | | | | | | | — | | | | | | | | | | | | | |
| 7. Code, check, punch and tabulate post-test-data | | | | | | | | | | | | | — | — | — | | | | | | | | | |
| C. Analysis phase | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Analyze data | | | | | | | | | | | | | | | | — | | | | | | | | |
| 2. Write research report | | | | | | | | | | | | | | | | | — | | | | | | | |
| 3. Disseminate report | | | | | | | | | | | | | | | | | | — | | | | | | |

*Work schedule chart gives an indication of time allocation for completing different activities of the study.

*Some samples*

## Chapter Four

# DATA ANALYSIS TECHNIQUES*

After the evaluative information has been gathered, the next concern is how to summarize it and draw meanings from it. This is often referred to as the statistical treatment of the data. This means tabulating, summarizing, interpreting and making inferences from the available information.

The purposes of statistics are to:

1. describe what is typical or average in a group;
2. describe the spread or variability of a group;
3. describe the relationship of two variables in a group;
4. compare two or more groups;
5. determine the probability of occurrence of a statistic purely by chance along;
6. estimate the value of an unknown parameter; and
7. estimate the level of confidence of a certain value or statistics.

### Measures of central tendency

To describe a group in terms of what is average or typical, the *mode*, the *median* or the *mean* can be used. The mode is the most frequently occurring value. The median is what characterizes the middle point of a distribution. The mean is the arithmetical average of the values of a variable.

---

*Based on the lecture presentation of Dr. Milagros D. Ibe, Professor, College of Education, University of the Philippines, consultant of the Regional Training Workshop on Evaluative Research in Population Education in Manila, from 20 to 31 May 1985.

The mode is the measure of average used for variables measured at the nominal level while the median is used to represent the average for a variable measured at the ordinal level. The *mean* is used to reflect the average of a distribution which uses measurement at the interval or ratio level.

## Measures of variation

The distance (or difference) between the highest value and the lowest values in a distribution is called the *range*. It is the least technical measure of dispersion or variability. For variables measured on the ordinal level, the average deviation and the interquartile range are used as measures of variability. The most technical measure of variability is the standard deviation. It is applied when the level of measurement is either interval or ratio. At these two levels, mathematical formulas are used for finding the average and the standard deviation.

$$\text{Mean} = \frac{\text{Sum of all the values}}{\text{Number of cases}}$$

$$M = \frac{\Sigma X}{N}$$

Standard deviation = the square root of the average of the squared deviations from the mean.

$$SD = \sqrt{\frac{\Sigma (X-M)^2}{N}}$$

For the standard deviation from a sample, the equivalent formula is:

$$S = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N-1}}$$

Table 13 gives a summary of the descriptive statistical procedures used at different levels of measurement.

Table 13. Descriptive statistical procedures

| Scale of | Distribution | | Measure of | |
|---|---|---|---|---|
| | | | Average | Dispersion/Variability |
| VARIABLE | Nominal | F, % in each category | Mode | Index of dispersion |
| | Ordinal | F, % in each or position | Median | Interquartile range |
| | Interval | F, % in each interval | Mean | Standard deviation |
| | Ratio | F, % in each interval | Mean | Standard deviation |

## Measures of relationship

As in the case of measures to describe what is typical/average and the extent of variability of a group, the statistical procedures to measure relationships of paired variables depend on the level at which the variables are measured. The Pearson correlation technique is used when both variables are measured at the interval level. The formula is:

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2]\ [N\Sigma Y^2 - (\Sigma Y)^2]}}$$

Where X and Y represent the two variables whose extent of relationship is being measured.

N = the number of cases

When both variables are continuous but measured at the ordinal level, the Spearman rank correlation technique is used. The formula is:

$$r_s = 1 - \frac{6\Sigma d^2}{N(N^2 - 1)}$$

Where N = the number of cases
d = the difference between the ranks of corresponding scores

Chi square is used as an index of dependence between two variables which are both measured at the nominal level. The chi square formula is:

$$\text{Chi square or } X^2 = \frac{\Sigma(O - E)^2}{E}$$

Where $O$ = the observed frequency
$E$ = the expected frequency

To obtain a coefficient of relationship the chi square is expressed as a phi (pronounded "phee") coefficient by means of this formula:

$$r_\phi = \frac{X^2}{N}$$

Where $r_\phi$ = the phi coefficient of correlation
$N$ = the number of cases
$X^2$ = the chi square value

## Comparison of two groups

Two groups can be compared in terms of their means or their variances.

These are the techniques often used to compare two groups:

1. The t-test = this is a parametric technique used to compare the mean scores of two independent samples. The difference of the mean scores in relation to the standard error of the combined variance of the two sets of scores is taken as a t-ratio. The formula is:

$$t = \frac{M_1 - M_2}{\sqrt{\left[\dfrac{S_1^2 (N_1 - 1) + S_2^2 (N_2 - 1)}{N_1 + N_2 - 2}\right]\left[\dfrac{1}{N_1} + \dfrac{1}{N_2}\right]}}$$

Where $N_1$ and $N_2$ = the number of cases in groups 1 and 2, respectively

$S_1$ and $S_2$ = the standard deviations of groups 1 and 2

$M_1$ and $M_2$ = the mean scores of the two groups

When $N_1 = N_2$, the formula is written simply as:

$$t = \frac{M_1 - M_2}{\sqrt{\frac{S_1^2 + S_2^2}{N_1}}}$$

A corresponding non-parametric test for comparing the scores of two independent samples is the Mann - Whitney U-test.

## Comparing related or matched samples

When subjects/respondents are matched with each other (as in the case of twins, husband and wife distributed across two samples) or matched with themselves as in the pretest - post-test situation where the same respondents take both tests, mean scores can be statistically analyzed for difference by means of the t-test for related samples. This statistical test looks into the diference between the means of the paired or matched samples in relation to the standard error of the difference between scores.

The t formula used is:

$$t = \frac{\text{Mean difference}}{\text{Standard error of the difference}}$$

$$= \frac{D}{\frac{SD}{\sqrt{N}}}$$

Where D = mean difference
SD = standard deviation of the difference
N = number of corresponding pairs/matches

Corresponding non-parametric tests of difference between two matched/related samples are (i) the sign test; and (ii) the Wilcoxon matched Pairs Signed Ranks test.

*Example:*

Suppose the pretest-post-test scores on a knowledge test given to 12 students are as follows:

| Student | Scores<br>Pretest-Post-test | | Gain | Gains squared |
|---|---|---|---|---|
| A | 2 | 7 | 5 | 25 |
| B | 3 | 6 | 3 | 9 |
| C | 1 | 8 | 7 | 49 |
| D | 0 | 3 | 3 | 9 |
| E | 5 | 5 | 0 | 0 |
| F | 4 | 3 | -1 | 1 |
| G | 1 | 6 | 5 | 25 |
| H | 0 | 4 | 4 | 16 |
| I | 3 | 2 | -1 | 1 |
| J | 2 | 7 | 5 | 25 |
| K | 4 | 7 | 3 | 9 |
| L | 1 | 5 | 4 | 16 |
| Total | 26 | 63 | 37 | 185 |

Sum of the pretest scores = 26
Sum of the post-test scores = 63
Sum of the gain scores = 37

$$\text{Mean gain} = \frac{37}{12} = 3.08$$

The sum of the squared gain scores = 185

Standard deviation of the gain/difference scores:

$$SD = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N-1}}$$

$$= \sqrt{\frac{185 - \frac{(37)^2}{12}}{11}} = 2.54$$

Hence:

$$t = \frac{3.08}{\frac{2.54}{\sqrt{12}}} = 4.20$$

The critical t-value at the .05 probability level for 11 degrees of freedom is only 2.201. Our computed value for t is much higher than the tabular value; hence, we reject the hypotheses that the post-test scores are the same as the pretest scores. (See Annex III).

Rejection of this null hypotheses means that there is a significant difference between the pretest and post-test scores.

## The sign test

To use the sign test on the same data we note the direction of change in score from the pretest to the post-test. We say "+" when there is an increase and "-" when there is a decrease. If the pretest and post-test scores of an individual are exactly the same we say there is no change, and write zero. Hence, the same data can be presented as follows:

| Student | Score | | Charge | Amount of change |
|---|---|---|---|---|
| | Pre | Post | | |
| A | 2 | 7 | + | 5 |
| B | 3 | 6 | + | 3 |
| C | 1 | 8 | + | 7 |
| D | 0 | 3 | + | 3 |
| E | 5 | 5 | 0 | |
| F | 4 | 3 | - | 1 |
| G | 1 | 6 | + | 5 |
| H | 0 | 4 | + | 4 |
| I | 3 | 2 | - | 1 |
| J | 2 | 7 | + | 5 |
| K | 4 | 7 | + | 3 |
| L | 1 | 5 | + | 4 |

We see that: One did not change (0)
9 changed positively (+)
2 changed negatively (-)

Therefore, out of the 11 who changed, two (2) changed in the negative direction. The binomial probability of $\binom{11}{2}$ based on the probability table is:

$$> P\binom{11}{2} = .033$$

This means that the observed phenomenon of 11 changes, two in the negative direction, can happen purely by chance alone 33 times in 1,000 events. This probability is less likely than .05, hence, we say that the statistics is significant. Therefore, we reject the null hypothesis that there was no change from pretest to post-test. This is essentially the *sign* test.

Note, however, that the sign test only considered the direction (or sign) of the change, but not the amount of change. If we study the scores we find that not all the 11 "changes" changed in the same amount. Student C changed the most because his score increased by 7 points in the post-test. If we rank the 11 students in terms of their change scores (starting with the least change as rank 1) we note that the sum of the ranks of the negative changes is 3 (two scores of negative 1 have ranks of 1.5 each). This is the Wilcoxon t-value. It has a probability of occurrence of less than 1 in 1,000. Hence, we say that there is a significant change or gain from the pretest to the post-test; that is, the changes are very unlikely to have happened by chance or luck, but are due to something which happened between the two testing times.

Hence, we see that all the three statistical tests [t-test, sign test and Wilcoxon (test)] results point to the fact that there is a significant difference between the pretest and the post-test.

Certain statistical techniques are commonly applicable to a number of the evaluative designs presented in Chapter Two. For example, the t-test for related samples could be used to determine whether the difference between pretest and post-test mean scores is significant; the t-test for independent samples is appropriate for determining the significance of the difference between mean scores of an experimental group and a control group. The chi square test can be used to determine whether there is a significant relationship between two variables.

Indices of the relationship between two variables can be obtained through (i) Pearson's product-moment correlation coefficient; and (ii) Spearman's rank correlation coefficient.

In the following pages, these five statistical techniques are illustrated through hypothetical data accompanied by tabulated summaries of the application of the techniques.

1. t-test for matched groups
2. t-test for independent groups
3. Spearman's rank correlation technique
4. Pearson's product-moment correlation technique
5. Chi square test.

## t-test for matched samples

Presented on page 117 are data obtained from three groups taught by the innovative approach to in-service training of teachers of population education. (See the research problem on formal education: Quasi-experimental design).

The situation calls for the t-test for matched or related samples. The statistical test is summarized in Table 14.

Table 14. Test of significance of gains in knowledge of population concepts of three teacher training groups

| Group | N | Mean score | | Gain in scores | SD of gain | t-ratio | Critical value at the .05 level |
|---|---|---|---|---|---|---|---|
| | | Pretest | Post-test | | | | |
| I | 30 | 4.30 | 8.56 | 4.26 | 3.6 | 6.48 | 2.045 |
| II | 32 | 3.60 | 8.03 | 4.40 | 2.91 | 8.54 | 2.042 |
| III | 37 | 3.95 | 7.45 | 3.50 | 2.39 | 8.80 | 2.021 |

Interpretation:

1. From the above table, it is clear that the training programme is effective, with all groups showing very significant gains.
2. Since there is consistency in the results from the three groups, it may be concluded that the training approach is effective.

## Hypothetical raw data on pretest-post-test scores of three groups of in-service teacher exposed to an innovative approach

| Group I (N = 30) | | Group II (N = 32) | | Group III (N = 37) | |
|---|---|---|---|---|---|
| Pre | Post | Pre | Post | Pre | Post |
| 8 | 10 | 6 | 14 | 4 | 12 |
| 4 | 12 | 3 | 9 | 0 | 6 |
| 3 | 9 | 4 | 4 | 0 | 4 |
| 2 | 17 | 4 | 8 | 5 | 7 |
| 6 | 6 | 1 | 7 | 3 | 5 |
| 4 | 12 | 0 | 5 | 4 | 6 |
| 1 | 8 | 3 | 8 | 3 | 5 |
| 2 | 8 | 8 | 8 | 5 | 10 |
| 0 | 9 | 3 | 9 | 2 | 7 |
| 4 | 10 | 2 | 10 | 2 | 6 |
| 5 | 12 | 1 | 6 | 1 | 5 |
| 8 | 5 | 4 | 10 | 4 | 8 |
| 4 | 4 | 5 | 6 | 4 | 10 |
| 10 | 9 | 7 | 5 | 5 | 9 |
| 0 | 3 | 3 | 4 | 6 | 10 |
| 5 | 7 | 2 | 8 | 4 | 4 |
| 6 | 12 | 4 | 10 | 3 | 6 |
| 7 | 12 | 5 | 16 | 5 | 5 |
| 3 | 10 | 0 | 4 | 4 | 8 |
| 2 | 4 | 6 | 15 | 4 | 5 |
| 4 | 8 | 4 | 10 | 3 | 6 |
| 1 | 7 | 3 | 8 | 8 | 6 |
| 5 | 8 | 5 | 9 | 4 | 9 |
| 6 | 7 | 5 | 5 | 1 | 4 |
| 5 | 10 | 4 | 10 | 6 | 10 |
| 4 | 8 | 2 | 5 | 7 | 7 |
| 3 | 5 | 5 | 8 | 6 | 11 |
| 4 | 9 | 7 | 6 | 5 | 8 |
| 10 | 10 | 1 | 7 | 0 | 6 |
| 3 | 6 | 2 | 5 | 4 | 12 |
| | | 2 | 5 | 3 | 5 |
| | | 5 | 11 | 8 | 8 |
| | | | | 2 | 4 |
| | | | | 3 | 9 |
| | | | | 4 | 10 |

Table 15 gives a summary of the t-test of gains in knowledge of an experimental and a control group in a study using a pretest-post-test control group design. The situation also calls for a t-test for matched samples.

### Table 15. t-test of gain scores on knowledge of family planning from pretest to post-test

| Group | Mean score | | | | | |
|---|---|---|---|---|---|---|
| | N | Pre | Post | Gain | SD | t-ratio |
| Experimental | 30 | 6.00 | 7.87 | 1.87 | 1.66 | 6.23*** |
| Control | 30 | 5.10 | 4.63 | -0.47 | 0.77 | -3.36** |

*** - Significant at the .001 level
** - Significant at the .01 level

Both the control and experimental groups changed very significantly. The t-values obtained (-3.36 and 6.23) are both highly significant. But whereas the experimental group changed positively, the control group changed negatively. The changes noted are not likely to be due to chance variations.

## t-test for independent groups

Table 16 summarizes the statistical test applied to the mean scores of two hypothetical groups (experimental and control) on a knowledge test. The formula used for computing the t-ratio is:

$$t = \frac{M_1 - M_2}{\sqrt{\left[\frac{SD_1^2 (N_1 - 1) + SD_2^2 (N_2 - 1)}{N_1 + N_2 - 2}\right]\left[\frac{1}{N_1} + \frac{1}{N_2}\right]}}$$

Where $M_1$ and $M_2$ are the mean scores of two groups
$N_1$ and $N_2$ are the group sizes
$SD_1$ and $SD_2$ are the standard deviations

The critical value for t and the .05 level of significance for 58 degrees of freedom is 2.021.

Table 16. t-test of comparison between means of the control and experimental groups

| | Group | N | Mean | SD | t-ratio (df = 58) |
|---|---|---|---|---|---|
| Pretest: | Experimental | 30 | 6.00 | 2.53 | 1.39 NS |
| | Control | 30 | 5.10 | 2.47 | |
| Post-test: | Experimental | 30 | 7.87 | 1.76 | 5.98 *** |
| | Control | 30 | 4.63 | 2.39 | |
| Gain: | Experimental | 30 | 1.87 | 1.68 | 6.94 *** |
| | Control | 30 | -0.47 | 0.77 | |

*** - Significant at the .001 level
NS - Not significant

The data in Table 16 indicate that the control and experimental groups did not differ significantly at the start of the experiment. In other words they were initially comparable.

After the treatment, the experimental group scored significantly higher in the knowledge post-test. The mean gain score of the experimental group is also very significantly higher than that of the control group.

The results lead to the rejection of the hypothesis that the two treatment groups do not differ. The data show that the experimental treatment is more effective than the treatment given to the control group.

## Spearman's rank correlation

Table 17 illustrates how the Spearman rank correlation coefficient is obtained between two variables measured at least on the ordinal level. The variables are (i) knowledge of population concepts; and (ii) attitude toward population education.

## Table 17. Computation of the Spearman's rank correlation coefficient between population education attitude and knowledge scores

| Student | Knowledge score | Rank | Attitude score | Rank | Difference | d² |
|---|---|---|---|---|---|---|
| A | 8 | 23.5 | 24 | 4 | 19.5 | 380.25 |
| B | 10 | 15.5 | 20 | 10 | 5.5 | 30.25 |
| C | 10 | 15.5 | 20 | 10 | 5.5 | 30.25 |
| D | 11 | 11.5 | 28 | 1 | 10.5 | 110.25 |
| E | 9 | 20 | 19 | 14 | 6.0 | 36.00 |
| F | 12 | 8 | 16 | 22.5 | -14.5 | 210.25 |
| G | 10 | 15.5 | 14 | 25.5 | -10.0 | 100.00 |
| H | 8 | 23.5 | 14 | 25.5 | - 2.0 | 4.00 |
| I | 12 | 8 | 12 | 28.5 | -20.5 | 420.25 |
| J | 10 | 15.5 | 20 | 10 | 5.5 | 30.25 |
| K | 10 | 15.5 | 18 | 18 | - 2.5 | 6.25 |
| L | 12 | 8.0 | 25 | 2 | 6.0 | 36.00 |
| M | 8 | 23.5 | 20 | 10 | 13.5 | 182.25 |
| N | 11 | 11.5 | 18 | 18 | - 6.5 | 42.25 |
| O | 15 | 2.5 | 24 | 4 | - 1.5 | 2.25 |
| P | 6 | 28 | 21 | 7 | 21.0 | 441.00 |
| Q | 7 | 26.5 | 18 | 18 | 8.5 | 72.25 |
| R | 10 | 15.5 | 20 | 10 | 5.5 | 30.25 |
| S | 9 | 20 | 22 | 6 | 14.0 | 196.00 |
| T | 12 | 8 | 16 | 22.5 | -14.5 | 210.25 |
| U | 13 | 4.5 | 24 | 4 | 0.5 | 0.25 |
| V | 15 | 2.5 | 19 | 14 | -11.5 | 132.25 |
| W | 12 | 4.5 | 12 | 28.5 | -24.0 | 576.00 |
| X | 8 | 23.5 | 12 | 28.5 | - 5.0 | 25.00 |
| Y | 17 | 1 | 18 | 18 | -17.0 | 289.00 |
| Z | 9 | 20 | 15 | 24 | - 4.0 | 16.00 |
| a | 12 | 8 | 19 | 14 | - 6.0 | 36.00 |
| b | 3 | 29 | 12 | 28.5 | 0.5 | 0.25 |
| c | 2 | 30 | 18 | 18 | 12.0 | 144.00 |
| d | 7 | 26.5 | 17 | 21 | 5.5 | 30.25 |

$\Sigma d^2 = 3819.50$

The formula for the Spearman's rank correlation coefficient ($r_s$) is:

$$r_s = 1 - \frac{6 \quad d^2}{N\ (N^2 - 1)}$$

Where d = difference between ranks of corresponding scores

n = number of cases

Hence $r_s = 1 - \frac{6\ (3819.5)}{30\ (899)}$

$r_s = .1502$

The $r_s$ obtained is far below the critical value ($r = .3809$) for 28 degrees of freedom. Hence, we cannot say that there is a relationship between the two variables (knowledge and attitude). (See Annex IV).

## Pearson correlation coefficient

In the *ex post facto* design described in Chapter 3, the researcher proposes to identify correlates to teacher's attitudes and knowledge of population education on one hand, and selected teacher variables on the other hand. The situation calls for the Pearson product moment correlation technique.

On the following page are some raw data dealing with some of the variables covered by the proposed study. Pearson correlation coefficients were computed from the data. The coefficients are summarized in Table 18.

The research hypothesis is that there is a relationship between the dependent variables and each independent variable.

## Raw data on selected variables

| Variables (scaled) | | | | Perception of supportiveness | | | Test scores | |
|---|---|---|---|---|---|---|---|---|
| Respondent No. | Age | Educational attainment | Teaching experience | Administrators | Community | Other teachers | Knowledge | Attitudinal |
| 1 | 5 | 2 | 5 | 3 | 3 | 3 | 8 | 40 |
| 2 | 6 | 2 | 5 | 3 | 3 | 3 | 2 | 35 |
| 3 | 1 | 2 | 0 | 1 | 1 | 1 | 5 | 45 |
| 4 | 1 | 6 | 0 | 2 | 3 | 1 | 7 | 45 |
| 5 | 2 | 3 | 0 | 2 | 2 | 1 | 11 | 45 |
| 6 | 6 | 6 | 5 | 1 | 1 | 1 | 12 | 60 |
| 7 | 4 | 3 | 5 | 3 | 4 | 3 | 1 | 40 |
| 8 | 1 | 2 | 1 | 3 | 3 | 2 | 7 | 48 |
| 9 | 5 | 2 | 5 | 3 | 2 | 2 | 8 | 50 |
| 10 | 4 | 3 | 5 | 1 | 2 | 2 | 6 | 40 |
| 11 | 3 | 3 | 1 | 1 | 2 | 2 | 8 | 35 |
| 12 | 1 | 6 | 1 | 1 | 2 | 2 | 8 | 65 |
| 13 | 2 | 2 | 2 | 3 | 3 | 3 | 10 | 60 |
| 14 | 3 | 3 | 4 | 1 | 1 | 2 | 5 | 30 |
| 15 | 1 | 6 | 1 | 3 | 5 | 3 | 7 | 45 |
| 16 | 2 | 2 | 1 | 4 | 4 | 4 | 5 | 35 |
| 17 | 4 | 2 | 5 | 1 | 2 | 1 | 5 | 42 |
| 18 | 1 | 6 | 2 | 5 | 4 | 2 | 11 | 50 |
| 19 | 5 | 2 | 3 | 1 | 1 | 2 | 6 | 42 |

## Table 18. Summary of Pearson correlation coefficient between knowledge/attitudes and selected teacher vribles (N = 19)

| Teacher variable | Correlation (r) knowledge | With attitude |
|---|---|---|
| 1. Age | -0.19 | -0.41 |
| 2. Teaching experience | -0.25 | -0.49* |
| 3. Perceived support of | | |
| a) administrator | 0.10 | 0.62 |
| b) community | 0.08 | 0.64** |
| c) other teachers | -0.35 | -0.48 |

df = 17; critical r-value at .01 level = .455
* - Significant at the .05 level
** - Significant at the .01 level

## Interpretation

The knowledge scores are not significantly correlated with any of the teacher attributes studied. The sample size (19) and the fact that the teachers were all from one cohort of teacher trainees could be the reason for the low correlations.

The attitude scores correlated significantly with perceived community support and negatively with teaching experience and other teachers' support.

## Chi square test

Tables 19 and 20 and the corresponding chi square values obtained from them illustrate the test of relationship/independence of two variables.

Table 19 tests the relationship between location of school and the attitude of NFE teachers' attitudes toward population issues.

**Table 19. Chi square analysis of the relation between attitude towards population issues and location of school**

Attitudes score

| Location of school | Low | High | Total |
|---|---|---|---|
| Rural | 14 | 4 | 18 |
| Urban | 1 | 11 | 12 |
| Total | 15 | 15 | 30 |

$X^2$ = 6.94 (Significant at the .05 level)

Critical value $X^2$ = 3.84 ($p = .05$) (See Annex V).

$H_1$ = There is a relationship between attitudes of teachers and location of the school where they teach.

$H_0$ = There is no relationship between attitudes towards population issues and location of schools of NFE tutors/teachers.

*Decision:* Since the computed $X^2$ value is higher than the critical value we reject the null hypothesis. The NFE teachers/tutors in rural areas have less positive attitudes than those in urban areas as measured by the post-test.

Below is a set-up for applying the chi square test applied to a 2 x 3 contingency table. This is followed by the computation for the chi square value.

**Table 20. Test of difference between the experimental and control groups' attitudes toward population education**

**Post score**

| Attitude | Control group | Experimental group | Total |
|---|---|---|---|
| Negative | 14 (11.5) | 9 (11.5) | 23 |
| Neutral | 4 (5.5) | 7 (5.5) | 11 |
| Positive | 12 (13.0) | 14 (13.0) | 26 |
| Total | 30 | 30 | 60 |

$$X^2 = \frac{\Sigma(0 - E)^2}{E}$$

$$X^2 = \frac{(14-11.5)^2}{11.5} + \frac{(9-11.5)^2}{11.5} + \frac{(4-5.5)^2}{5.5} + \frac{(7-5.5)^2}{5.5}$$

$$+ \frac{(12-13)^2}{13} + \frac{(14-13)^2}{13}$$

$$= \frac{(+2.5)^2}{11.5} + \frac{(-2.5)^2}{11.5} + \frac{(-1.5)^2}{5.5} + \frac{(+1.5)^2}{5.5}$$

$$+ \frac{(-1)^2}{13} + \frac{(1)2}{13}$$

$$= 0.54 + 0.54 + 0.41 + 0.41 + 0.08$$

$$+ 0.08 = 2.06$$

$X^2 = 2.06$ NS

Critical $X^2$ (2 df) = 5.99; p = .05

$H_o$ = There is no difference in the attitudes towards population education of NFE teachers/tutors trained in the self-instructional modality and those trained through the face-to-face modality.

$H_1$ = There is a significant difference in the attitudes towards population education of NFE teachers/tutors trained in the self-instructional modality and those trained through the face-to-face modality.

*Decision:* Accept the null hypothesis ($H_o$) since the computed $X^2$ value (2.06) is much lower than the tabular value of 5.99 at the .05 level. In other words, we cannot say that the two modalities differ significantly in their effects on teachers attitudes.

## Summary

There are many more statistical techniques, which one could be used in evaluative research. Only the more basic analysis techniques were included in this Manual.

## Chapter Five

# GUIDELINES FOR WRITING AN EVALUATIVE RESEARCH REPORT

The guidelines set out here are intended to be suggestive rather than definitive, and will need to be changed as appropriate in the light of the particular evaluative research that is being reported.

The report should have a title that indicates as meaningfully as possible what the evaluative research is about. The report should contain the following major sections:

1. Introduction
2. Rationale
3. Objectives
4. Conceptual framework
5. Hypthesis/hypotheses
6. Research design and sampling procedure
7. The collection of data
8. The analysis of data
9. Conclusions and recommendations
10. Annexes

Brief guidelines are given below for writing each section followed by a short note regarding the annexes.

### Introduction

As the evaluative research is carried out to arrive at a decision regarding some aspects of a programme about to be undertaken or in the process of being implemented or that has been completed, an account should be given of the problem for which the programme is envisaged as contributing to a solution. The long-term goal of the programme and its specific objectives should be stated as envisioned. A few details as to who would be the clientele for the intervention, and the nature of the intervention should be provided.

The intent of such an account is to place the evaluation research study in context, and it should be written concisely and selectively. What follows below relates to the reporting of the research itself.

## Rationale

The rationale for the research should be stated in order to explain why it is being undertaken. In addition, the problem addressed to by the study may also be stated in this section. Limitations on the scope of the research may also be pointed out.

## Objectives

Here the specific objective(s) of the research should be stated. Objectives are statements about what the researcher wishes to find out or determine.

## Conceptual framework

The conceptual framework of the research should be indicated. This refers to the relationships between the different concepts/constructs to be studied.

## Hypothesis/hypotheses

The hypothesis/hypotheses to be tested in the research should be stated. If any previous studies or insights from the documentation of the programme or any other programmes led to the formulation of these particular hypotheses, a brief account should be given before the hypotheses themselves are set out.

Hypotheses are tentative answers to the problems or objectives of the studies.

## Research design and sampling procedures

An account should be given of the research design and the reasons for the choice of the particular design, especially if it is one of the relatively weak ones. The variables (independent, dependent) should also be specified. Possible confounding factors that were foreseen may also be mentioned here.

Full particulars should be given of the sampling method used for selecting the respondents. In some cases, there may be more than one category of respondents and if so the way in which each category was selected should be given. In order to give the composition of the sample, two or three of the more important tables giving the demographic data may be included here, while stating the identification numbers of tables in the second annex that provide other kinds of demographic data.

## The collection of data

A full description should be given of the procedure adopted for the collection of data. The extent to which documentation (e.g. reports) is used and the nature of the information collected should be indicated. There should be a complete description of the instruments (tests, attitude scales, rating scales, interview schedules, proformae for observation, etc.) used in the research. If any instruments that were already existing were used, an account should be given of the condition under which they had been developed and used. In the case of instruments specially devised for the research, a full description should be given of the way in which they were developed. The table(s) of specifications prepared and used in order to ensure that the tests items, etc. in the instruments cover comprehensively the major thrusts of the intervention should be incorporated, and the distribution of items among the various components should be indicated on the table(s) of specifications. Steps taken for obtaining qualitative judgments regarding the instruments should be described.

An account should be given of the sample and the procedure followed for the trial administration of the instruments. Item analysis data (e.g. indices of discrimination, ease/facility) should be provided in tables in an annex, and the availability of each instrument as a whole should be indicated when this is possible. Action taken to revise the instruments on the basis of the trial administration should be described, and the major differences between the trial version and the final version should be indicated. The instruments used in the final administration should be given as another annex with the following data for each: instructions for administration, correct responses (where applicable), marking scheme and reliability (when possible). A description should be given of the procedure followed for the final administration of the instruments, e.g. who administered, to whom and how. If any persons other than the chief researcher were involved in data collection (e.g. for interviews, making observations, etc.); the action taken to train them should be described. The time schedule according to which the various activities were undertaken should be included in the first annex.

## The analysis of data

The data derived from instruments may consist of some information that has to be analyzed on a qualitative basis, and which cannot be transferred to tables. The principal findings from the qualitative analysis of such data should be stated. Some of the data would be transferred to tables. Not all the data transferred to tables will lend themselves to statistical analysis and what is possible is to record them. But in the case of some data transferred to tables, statistical analysis will be possible. All the data transferred as above to tables should be incorporated as an annex. Where statistical analysis is possible, it should be carried out and the particular statistical test indicated beneath the table with an indication regarding its significance at the 5 per cent level. The findings based on the statistical analysis should be in the annex.

## Conclusions and recommendations

In this section, attention should be drawn to the principal findings of the research, taking care to point out any reservations that should be borne in mind in accepting them. The recommendations that follow from the findings should also be stated.

**Note**

The time schedule for the various activities of the research can be given as Annex I. Annex II can contain the tables with demographic data, other than those already included in the body of the report. Item analysis data from the trial administration can be contained in Annex III. Annex IV should contain the test instruments with the following data for each; instructions for administration, correct responses (where applicable), marking scheme, the coefficient of reliability (where applicable), and any other information considered useful. Annex V should contain all the remaining tables, and where statistical analysis has been carried out details regarding the tests applied and the results, etc. should be given.

## Chapter Six

# COST-EFFECTIVENESS OF POPULATION EDUCATION ACTIVITIES*

Cost-effectiveness (CE) analysis refers to the evaluation of alternatives according to both their costs and their effects with regard to producing some outcome or set of outcomes (e.g. test scores). Often, in population education projects, an evaluation and decisions must be made on the choice of alternative approaches to meet a particular objective, e.g. providing a knowledge base in population and population education for teachers. Many times, a decision on an approach must be based on a consideration of costs. For example, it may be too costly for all teachers to be called into the provincial centres to participate in a two-week training workshop. Hence, alternative methods must be devised to meet a particular objective which can be accomplished within the limits of the budget available. A CE analysis combines measures of effectiveness with all alternatives in relation to their costs. Both the costs and effects of alternatives are taken into account in evaluating materials, methods, programmes, etc. with similar goals. It is assumed that (i) only programmes with similar or identical goals can be compared; and (ii) a common measure of effectiveness can be used to assess them. These effectiveness data can then be combined with costs in order to provide a cost-effectiveness evaluation that will enable the selection of those approaches which provide the maximum effectiveness per level of cost or which require the least cost per level of effectiveness.

Evaluative research and cost-effectiveness. Before any cost-effectiveness analysis can be made, it is first necessary to determine the programme objectives and an appropriate measure of effectiveness. For example, valid and reliable measures of effectiveness of alternative

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*Based on Henry M. Levin, *Cost-effectiveness: A primer.* Beverly Hills/London/New Delhi: Sage Publications, 1983.

interventions, e.g. different methods of teaching on the learning of students and different modalities of training on enhancement of teaching competencies of population education teachers - may be determined through evaluative research. The standard evaluative research approaches already discussed in this workshop would be used for these measures of effectiveness, e.g. whether there are differences in learning in students using different methods (lecture, textbooks, participatory methods, etc.). In other words, the effectiveness of each instructional strategy as determined by test scores of students in comparison with those of a control group would be used as a basis for determining "effectiveness". Below are some effectiveness measures in population education.

| *Programme objectives* | *Measures of effectiveness* |
|---|---|
| Student learning | - Test scores |
| Student attitudes | - Attitude instruments |
| Teacher training | - Test scores<br>- Observation of classroom behaviour |
| Teacher attitudes | - Attitude instruments, interviews |

Evaluative research studies can provide data on the effectiveness of various approaches, methods and strategies for achieving each objective. Hence, it is the starting point for a cost-effectiveness analysis.

The costs of the various alternatives for meeting a particular objective are then assessed by determining the various inputs that they use and calculating their values. When the results of the effectiveness are combined with these costs, we can derive a cost-effectiveness ratio (C/E) that will show the relative costs for each measure of effectiveness. These results may show, for example, that the most "effective" approach is not always the most cost-effective. But without an analysis of costs, it would not be possible to know this.

Concept of cost and ingredients. In a cost analysis we need to ascertain the cost of an intervention in terms of the value of the resources that were used or lost by applying them in one way rather than in another.

This is done by specifying: first, all of the ingredients that are required for any particular intervention, e.g. personnel, equipment, materials, etc. Once these ingredients are specified, a value or cost estimate is placed on each of them. When the values of all the ingredients are added, the total cost of the intervention is established. Furthermore, how the cost burden is distributed among funding sources can be ascertained.

The identification and specification of ingredients is often facilitated by dividing the ingredients required into categories:

1. Personnel (human resources, full and part-time)
2. Facilities (offices, classroom, etc.)
3. Equipment and materials (books, typewriters, etc.)
4. Other programme inputs.
5. Client inputs (own transportation, food).

The ingredients should be specified in sufficient detail in order to allow a reasonably accurate cost estimate, especially the personnel component, which usually accounts for the largest contribution to the cost.

Cost-effectiveness analysis: an example. Table 21 represents a hypothetical set of cost-effectiveness results for a comparison of three different methods of in-service teacher training on the population knowledge acquisiton of teachers. Group A received training through a face-to-face workshop at a centre to which the participants travelled. Group B received training through self-learning modules on the same content, and Group C used a distance-learning method through radio and written workbook. The test scores were then compared statistically and the cost for each method was calculated by determining the various ingredients used and their values.

Table 21. Hypothetical cost-effectiveness results of different training methods

| Group | Method | Cost per Teacher (C) | Effectiveness (E) (Test scores) | C/E |
|---|---|---|---|---|
| A | Face-to-face | US$100 | 40 | 2.5 |
| B | Self-learning module | US$ 5 | 30 | 0.17 |
| C | Distance learning | US$ 10 | 10 | 1.0 |

The face-to-face approach shows a hypothetical cost of US$100 per teacher because of the high costs of the instructor, travel of participants, and per diem. The self-learning module and distance learning approaches required some travelling, but most of the cost was for the modules themselves. Personnel costs for these methods were low. The cost-effectiveness ratio, C/E was derived by dividing the cost per teacher for a one point improvement on the average in the test scores. While costs vary greatly from US$100 to US$5 (20-fold), the range of effectiveness is 40 to 10 (4-fold). In addition, the face-to-face group would cost a hypothetical US$2.50 a point to improve population education knowledge performance, the self-learning module method would cost only US$0.17 and the distance learning would cost US$1.00 in this hypothetical case. On this basis, the self-learning module method is most cost-effective, followed by distance learning. However, the most efficient approach, when costs are ignored, ranks last in terms of costs, i.e. for US$100 per teacher, this method produced the highest test scores (most effective). But by spending one-fifteenth of the cost per teacher, the self-learning produced three-fourths of that effect.

**The use of cost-effectiveness analyses.** The hypothetical example above tends to reflect the situation that is all too common in actual evaluations, in which the most "effective" approach is not always the most cost-effective. Yet, without an analysis of costs, it would be impossible to know this. Further, the adoption of the most "effective" alternative can actually cost many times as much as the most cost effective one.

While this kind of cost-effectiveness analysis is more likely to yield the types of information that are crucial to decisions on population education than when costs are ignored, it should not mean that these studies should be used mechanically to make decisions. There are always considerations that cannot be fully incorporated into the evaluations. For example, the personal contact between a stimulating lecturer and teachers, especially in relation to developing attitudes may not reflected in test scores, but they may be extremely important in population education, especially in motivating teachers to teach population education and developing a commitment to it. In addition, there may be organizational or instructional factors that make one alternative easier to implement than another. There may be cultural factors, e.g. those alternatives which are more similar to present approaches are more likely to provide predicted results over a longer term than those that represent a radical departure from existing practices. Thus, a consideration of only cost-effectiveness is inappropriate. Rather, the results provide useful information that must be combined with other pertinent data and background in selecting alternatives.

## Conclusion

Standard evaluation approaches to population education usually take account only of the effects of population education interventions. As population education expands and funds for it decline, policy decisions must be based on both costs and effectiveness of programmes. Cost-effectiveness analyses is one way of making it possible to choose those alternatives that provide the best results for any given resource or that minimize the resource utilization for any given outcome.

# ANNEXES

Annex I

## GROUP I

Chairman - Mr. Zhang Yongbiao
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Vice-Chairman - Mrs. Mallika Nitayaphorn
Thailand

Rapporteur - Dr. S.K. Saini
India

Members - Mr. Abdul Sami Shamin
Afghanistan

Mr. Muhammad Abdul Mannan
Bangladesh

Mr. Sudjinggo
Indonesia

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Unesco, Bangkok

Mr. Boniface Biyong
Unesco, Paris

## Annex II

## GROUP II

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Mrs. Solita Fangco
Philippines

Mr. Nguyen Khac Quynh
Socialist Republic of
Viet Nam

Mrs. Orapin Swaddipun
Thailand

Prof. J.E. Jayasuriya
Sri Lanka

Dr. Allan A. Kondo
Unesco, Pacific

## Annex III

## DISTRIBUTION OF *t* PROBABILITY

| df | .1 | .05 | .01 | .001 |
|---|---|---|---|---|
| 1 | 6.314 | 12.706 | 63.657 | 636.619 |
| 2 | 2.920 | 4.303 | 9.925 | 31.598 |
| 3 | 2.353 | 3.182 | 5.841 | 12.941 |
| 4 | 2.132 | 2.776 | 4.604 | 8.610 |
| 5 | 2.015 | 2.571 | 4.032 | 6.859 |
| 6 | 1.943 | 2.447 | 3.707 | 5.959 |
| 7 | 1.895 | 2.365 | 3.499 | 5.405 |
| 8 | 1.860 | 2.306 | 3.355 | 5.041 |
| 9 | 1.833 | 2.262 | 3.250 | 4.781 |
| 10 | 1.812 | 2.228 | 3.169 | 4.587 |
| 11 | 1.796 | 2.201 | 3.106 | 4.437 |
| 12 | 1.782 | 2.179 | 3.055 | 4.318 |
| 13 | 1.771 | 2.160 | 3.012 | 4.221 |
| 14 | 1.761 | 2.145 | 2.977 | 4.140 |
| 15 | 1.753 | 2.131 | 2.947 | 4.073 |
| 16 | 1.746 | 2.120 | 2.921 | 4.015 |
| 17 | 1.740 | 2.110 | 2.898 | 3.965 |
| 18 | 1.734 | 2.101 | 2.878 | 3.922 |
| 19 | 1.729 | 2.093 | 2.861 | 3.883 |
| 20 | 1.725 | 2.086 | 2.845 | 3.850 |
| 21 | 1.721 | 2.080 | 2.831 | 3.819 |
| 22 | 1.717 | 2.074 | 2.819 | 3.792 |
| 23 | 1.714 | 2.069 | 2.807 | 3.767 |
| 24 | 1.711 | 2.064 | 2.797 | 3.745 |
| 25 | 1.708 | 2.060 | 2.787 | 3.725 |
| 26 | 1.706 | 2.056 | 2.779 | 3.707 |
| 27 | 1.703 | 2.052 | 2.771 | 3.690 |
| 28 | 1.701 | 2.048 | 2.763 | 3.674 |
| 29 | 1.699 | 2.045 | 2.756 | 3.659 |
| 30 | 1.697 | 2.042 | 2.750 | 3.646 |
| 40 | 1.684 | 2.021 | 2.704 | 3.551 |
| 60 | 1.671 | 2.000 | 2.660 | 3.460 |
| 120 | 1.658 | 1.980 | 2.617 | 3.373 |
| 00 | 1.645 | 1.960 | 2.576 | 3.291 |

*Source:* Annex III is abridged fron Table III of R.A. Fisher and F. Yates. *Statistical Tables for Biological, Agricultural and Medical Research,* published by Oliver and Boyd Ltd., Edinburgh. Abridged with permission of the authors and publisher.

# Annex IV

## VALUES OF r FOR DIFFERENT LEVELS OF SIGNIFICANCE

| df | .1 | .05 | .02 | .01 | .001 |
|---|---|---|---|---|---|
| 1 | .98769 | .99692 | .999507 | .999877 | .9999988 |
| 2 | .90000 | .95000 | .98000 | .990000 | .99900 |
| 3 | .8054 | .8783 | .93433 | .95873 | .99116 |
| 4 | .7293 | .8114 | .8822 | .91720 | .97406 |
| 5 | .6694 | .7545 | .8329 | .8745 | .95074 |
| 6 | .6215 | .7067 | .7887 | .8343 | .92493 |
| 7 | .5822 | .6664 | .7498 | .7977 | .8982 |
| 8 | .5494 | .6319 | .7155 | .7646 | .8721 |
| 9 | .5214 | .6021 | .6851 | .7348 | .8471 |
| 10 | .4973 | .5760 | .6581 | .7079 | .8233 |
| 11 | .4762 | .5529 | .6339 | .6835 | .8010 |
| 12 | .4575 | .5324 | .6120 | .6614 | .7800 |
| 13 | .4409 | .5139 | .5923 | .6411 | .7603 |
| 14 | .4259 | .4973 | .5742 | .6226 | .7420 |
| 15 | .4124 | .4821 | .5577 | .6055 | .7246 |
| 16 | .4000 | .4683 | .5425 | .5897 | .7084 |
| 17 | .3887 | .4555 | .5285 | .5751 | .6932 |
| 18 | .3783 | .4438 | .5155 | .5614 | .6787 |
| 19 | .3687 | .4329 | .5034 | .5487 | .6652 |
| 20 | .3598 | .4227 | .4921 | .5368 | .6524 |
| 25 | .3233 | .3809 | .4451 | .4869 | .5974 |
| 30 | .2960 | .3494 | .4093 | .4487 | .5541 |
| 35 | .2746 | .3246 | .3810 | .4182 | .5189 |
| 40 | .2573 | .3044 | .3578 | .3932 | .4896 |
| 45 | .2428 | .2875 | .3384 | .3721 | .4648 |
| 50 | .2306 | .2732 | .3218 | .3541 | .4433 |
| 60 | .2108 | .2500 | .2948 | .3248 | .4078 |
| 70 | .1954 | .2319 | .2737 | .3017 | .3799 |
| 80 | .1829 | .2172 | .2565 | .2830 | .3568 |
| 90 | .1726 | .2050 | .2422 | .2673 | .3375 |
| 100 | .1638 | .1946 | .2301 | .2540 | .3211 |

*Source:* Annex IV is reprinted from Table VI of R.A. Fisher and F. Yates. *Statistical Tables for Biological, Agricultural, and Medical Research,* published by Oliver and Boyd Ltd., Edinburgh. Reprinted with permission of the authors and publishers.

## Annex V

## DISTRIBUTION OF $X^2$

| | Probability | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| df | .99 | .98 | .95 | .90 | .80 | .70 | .50 | .30 | .20 | .10 | .05 | .02 | .01 | .001 |
| 1 | $.0^3157$ | $.0^3628$ | .00393 | .0158 | .0642 | .148 | .455 | 1.074 | 1.642 | 2.706 | 3.841 | 5.412 | 6.635 | 10.827 |
| 2 | .0201 | .0404 | .103 | .211 | .446 | .713 | 1.386 | 2.408 | 3.219 | 4.605 | 5.991 | 7.824 | 9.210 | 13.815 |
| 3 | .115 | .185 | .352 | .584 | 1.005 | 1.424 | 2.366 | 3.665 | 4.642 | 6.251 | 7.815 | 9.837 | 11.345 | 16.268 |
| 4 | .297 | .429 | .711 | 1.064 | 1.649 | 2.195 | 3.357 | 4.878 | 5.989 | 7.779 | 9.488 | 11.668 | 13.277 | 18.465 |
| 5 | .554 | .752 | 1.145 | 1.610 | 2.343 | 3.000 | 4.351 | 6.064 | 7.289 | 9.236 | 11.070 | 13.388 | 15.086 | 20.517 |
| 6 | .872 | 1.134 | 1.635 | 2.204 | 3.070 | 3.828 | 5.348 | 7.231 | 8.558 | 10.645 | 12.592 | 15.033 | 16.812 | 22.457 |
| 7 | 1.239 | 1.564 | 2.167 | 2.833 | 3.822 | 4.671 | 6.346 | 8.383 | 9.803 | 12.017 | 14.067 | 16.622 | 18.475 | 24.322 |
| 8 | 1.646 | 2.032 | 2.733 | 3.490 | 4.594 | 5.527 | 7.344 | 9.524 | 11.030 | 13.362 | 15.507 | 18.168 | 20.090 | 26.125 |
| 9 | 2.088 | 2.532 | 3.325 | 4.168 | 5.380 | 6.393 | 8.343 | 10.656 | 12.242 | 14.684 | 16.919 | 19.679 | 21.666 | 27.877 |
| 10 | 2.558 | 3.059 | 3.940 | 4.865 | 6.179 | 7.267 | 9.342 | 11.781 | 13.442 | 15.987 | 18.307 | 21.161 | 23.209 | 29.588 |
| 11 | 3.053 | 3.609 | 4.575 | 5.578 | 6.989 | 8.148 | 10.341 | 12.899 | 14.631 | 17.275 | 19.675 | 22.618 | 24.725 | 31.264 |
| 12 | 3.571 | 4.178 | 5.226 | 6.304 | 7.807 | 9.034 | 11.340 | 14.011 | 15.812 | 18.549 | 21.026 | 24.054 | 26.217 | 32.909 |
| 13 | 4.107 | 4.765 | 5.892 | 7.042 | 8.634 | 9.926 | 12.340 | 15.119 | 16.985 | 19.812 | 22.362 | 25.472 | 27.688 | 34.528 |
| 14 | 4.660 | 5.368 | 6.571 | 7.790 | 9.467 | 10.821 | 13.339 | 16.222 | 18.151 | 21.064 | 23.685 | 26.873 | 29.141 | 36.123 |
| 15 | 5.229 | 5.985 | 7.261 | 8.547 | 10.307 | 11.721 | 14.339 | 17.322 | 19.311 | 22.307 | 24.996 | 28.259 | 30.578 | 37.697 |
| 16 | 5.812 | 6.614 | 7.962 | 9.312 | 11.152 | 12.624 | 15.338 | 18.418 | 20.465 | 23.542 | 26.296 | 29.633 | 32.000 | 39.252 |
| 17 | 6.408 | 7.255 | 8.672 | 10.085 | 12.002 | 13.531 | 16.338 | 19.511 | 21.615 | 24.769 | 27.587 | 30.995 | 33.409 | 40.790 |
| 18 | 7.015 | 7.906 | 9.390 | 10.865 | 12.857 | 14.440 | 17.338 | 20.601 | 22.760 | 25.989 | 28.869 | 32.346 | 34.805 | 42.312 |
| 19 | 7.633 | 8.567 | 10.117 | 11.651 | 13.716 | 15.352 | 18.338 | 21.689 | 23.900 | 27.204 | 30.144 | 33.687 | 36.191 | 43.820 |
| 20 | 8.260 | 9.237 | 10.851 | 12.443 | 14.578 | 16.266 | 19.337 | 22.775 | 25.038 | 28.412 | 31.410 | 35.020 | 37.566 | 45.315 |
| 21 | 8.897 | 9.915 | 11.591 | 13.240 | 15.445 | 17.182 | 20.337 | 23.858 | 26.171 | 29.615 | 32.671 | 36.343 | 38.932 | 46.797 |
| 22 | 9.542 | 10.600 | 12.338 | 14.041 | 16.314 | 18.101 | 21.337 | 24.939 | 27.301 | 30.813 | 33.924 | 37.659 | 40.289 | 48.268 |
| 23 | 10.196 | 11.293 | 13.091 | 14.848 | 17.187 | 19.021 | 22.337 | 26.018 | 28.429 | 32.007 | 35.172 | 38.968 | 41.638 | 49.728 |
| 24 | 10.856 | 11.992 | 13.848 | 15.659 | 18.062 | 19.943 | 23.337 | 27.096 | 29.553 | 33.196 | 36.415 | 40.270 | 42.980 | 51.179 |
| 25 | 11.524 | 12.697 | 14.611 | 16.473 | 18.940 | 20.867 | 24.337 | 28.172 | 30.675 | 34.382 | 37.652 | 41.566 | 44.314 | 52.620 |
| 26 | 12.198 | 13.409 | 15.379 | 17.292 | 19.820 | 21.792 | 25.336 | 29.246 | 31.795 | 35.563 | 38.885 | 42.856 | 45.642 | 54.052 |
| 27 | 12.879 | 14.125 | 16.151 | 18.114 | 20.703 | 22.719 | 26.336 | 30.319 | 32.912 | 36.741 | 40.113 | 44.140 | 46.963 | 55.476 |
| 28 | 13.565 | 14.847 | 16.928 | 18.939 | 21.588 | 23.647 | 27.336 | 31.391 | 34.027 | 37.916 | 41.337 | 45.419 | 48.278 | 56.893 |
| 29 | 14.256 | 15.574 | 17.708 | 19.768 | 22.475 | 24.577 | 28.336 | 32.461 | 35.139 | 39.087 | 42.557 | 46.693 | 49.588 | 58.302 |
| 30 | 14.953 | 16.306 | 18.493 | 20.599 | 23.364 | 25.508 | 29.336 | 33.530 | 36.250 | 40.256 | 43.773 | 47.962 | 50.892 | 59.703 |

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